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THE PHILIPPINE
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A REVIEW OF THE SCORPAENOID FISHES OF THE PHILIPPINES AND ADJACENT SEAS

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One of the most readily recognized families of fishes is that of the Scorpaenidae. This huge group is but a part of a vastly larger assemblage known as the Loricata or fishes with mailed cheeks. All these are characterized by having a bony stay or process running backward from the third suborbital bone across the cheek to the posterior margin of the preopercle. In some this bony stay is small and concealed under the skin and in others it degenerates till it is insignificant. However, in most forms it is well developed and forms a large ridge which is rough or carries strong sharp spines on its upper surface and posterior end.

The Scorpaenidae include a great variety of forms, hardly agreeing in anything except the suborbital stay. At least some bones of the head are usually armed, especially the angle of the preopercle; in more specialized forms the development of spines on the head is carried to extremes. The spinous dorsal fin is equal to or longer than the soft dorsal or the anal, the dorsal spines usually numerous and strong. The dorsal spines, and often some or all of the head spines, are venomous in many species. Some of the scorpaenoid fishes have venom of such toxicity that they are as dangerous as the most poisonous snakes.

The more primitive scorpaenoid fishes were evidently derived from perch-like ancestors. Their ctenoid scales are well de-

veloped; the ventrals are thoracic, usually with a spine and five rays, but may be rudimentary in more specialized forms; the anal has three spines. There are, however, only 3½ gills, and there is no slit behind the last one. As they become more specialized, the head develops great ridges, humps, and depressions; the anal spines may be reduced or lost. The head and body may develop tentacles, flaps, and other appendages, often very many, while the scales may become cycloid, reduced to tiny embedded non-imbricate cycloid scales, or disappear entirely, leaving the skin naked, when the body may be covered with warts or more or less velvety prickles.

Many scorpaenids possess such a development of skinny appendages that they resemble a rock covered with seaweeds and are very effectually hidden. Most of the group live among rocks or on the bottom. Many of these bottom dwellers have developed one or more separate free rays at the lower margin of the pectoral; these free rays are used to explore for food.

The scorpaenoids are carnivorous marine fishes of very widespread occurrence, but certain groups are found only in the tropical Indo-Pacific while others are confined to cooler waters. None are pelagic, nearly all being shore fishes of shallow or moderate depths. A few occur at 200 to 300 fathoms, and probably none live below 450 fathoms.

A number of scorpaenoid fishes along the west coast of North America and the east coast of Asia, south to Japan and Korea, are valuable food fishes. One or two kinds in the North Atlantic are also of some importance. In the Philippines none are taken in sufficient quantity to be factors in the market.

It is important, however, that people learn to recognize and know something about the scorpaenoid fishes that abound on reefs throughout the Islands. They should never be stepped upon or picked up or touched with bare hands. Such contacts are too dangerous, and may cause not only agonizing pain, but even death.

As already stated, all are marine, but a few kinds occur also in estuaries or may enter streams and live for a time on the gravel bottom of some rapid.

Little is known of the reproduction of Philippine scorpaenoids. While some lay eggs, many fishes of the family are viviparous. This is a field which should be investigated. More important would be a study of the venom of the more dangerous scorpaenoid fishes. This is an important topic of which practically nothing is known.

Many of the scorpion fishes are eaten in the Philippines. Several species attain a weight of one or two kilos and are therefore, large enough to furnish a meal. The meat is firm, white, and of good quality. The poison glands are usually removed by the fishermen before the fish are marketed. Few scorpion fishes are brought to the Manila market, as the trawlers in Manila Bay throw them overboard as fast as possible when their catch is emptied out on the deck. The fishermen working traps in Malampaya Sound also discard the scorpion fishes. In the markets of Cebu, Zamboanga, Culion, Jolo, Siasi, and many other places in the central and southern Philippines scorpion fishes are commonly seen. They are taken in bobos and nets, with hook and line, and with spears. No one makes a business of getting scorpion fishes, nor is there any special fishery for them in the central and southern Philippines. But if taken, they are kept and not thrown away, though they are always handled with great care.

The lengths given in this paper are of the standard length, that is from the snout tip to the caudal base, i.e., the last or hypural vertebra.

The number of scales in the lateral line is of little or no value in distinguishing species of scorpaenid fishes. It is necessary therefore, to do as in some other families of fishes such as Lutianidae (*also, mañgagat,* and *maya-maya*), and count the transverse rows of scales immediately above the lateral line. That is the method followed in this paper.

SCORPAENOID FAMILIES IN THE PHILIPPINES AND ADJACENT SEAS

A.—Hyo-palatine bones all present and normally developed; vertebrae 24 to 40; anterior ribs when present sessile or on very short parapophyses; posterior ribs on strong parapophyses; 2 nostrils on each side.

B.—Gill membranes free; pelvic fins well developed; ribs present, at least on posterior caudal vertebrae; spinous dorsal longer than soft dorsal; anal with 2 or 3 pungent spines, very rarely one weak spine ..... SCORPAENIDÆ

BB.—Gill membranes attached to isthmus.

C.—Gill membranes broadly attached to isthmus; ventrals very small, rudimentary I–2 or 3; no ribs; form suborbicular. CARACANTHIDÆ

CC.—Gill membranes attached to isthmus; ventrals well developed, I–4 or 5, the innermost ray adnate by a membrane to the abdomen; no scales; head large, rough, more or less uncouth and monstrous ..... SYNANCEIIDÆ

Family SCORPAENIDÆ

Key to genera of the Philippines and adjacent seas

A.—Dorsal origin far behind the eye, at or behind the nape.
B.—Body scaly, sometimes with skinny flaps; ventral always I–5.
C.—Lowermost pectoral ray not detached to form a separate feeler; no barbels on chin.
D.—Scales usually ctenoid, the lateral line not forming a wide scaleless groove; bones of the head not cavernous.
E.—Lateral line well developed and complete.
F.—Dorsal spines and pectorals not elongate or greatly produced; ectethmoid and vomer either jointed directly or by an intervening cartilage.
G.—Dorsal spines 13; no palatine teeth.
H.—Pectoral rays all normal.
I.—Anal II–5 to 7; preopercular spines 5.... *Hoplesebastes*
II.—Anal III–5 or 4; preopercular spines 4 *Scorpaenodes*
HH.—Tenth to thirteenth pectoral rays much elongated, the upper 9 divided, the 7 lower simple. *Hypomacrus*
GG.—Dorsal spines 12.
J.—Teeth present.
K.—Teeth in jaws, on vomer, and palatines. Cranium with many spines.
L.—Scales on top of head ctenoid; air bladder present. *Sebastiscus*
LL.—Scales on top of head cycloid or else absent; scales on body ctenoid, often with skinny flaps.
M.—A quadrilateral pit or depression at the nape; head naked or with cycloid scales imbedded in the skin.
N.—Preventral region more or less naked; crests on top of head with erect spines; suborbital ridge without erect spines ..... *Scorpaena*
NN.—Preventral region entirely scaled; crests on top of head and suborbital with erect spines ..... *Parascorpaena*
MM.—No depression or groove at the nape.
O.—Preorbital with a stout hooked downward-pointing spine; a stout nasal spine before eye; size small ..... *Sebastapistes*
OO.—No hooked spine on preorbital; sides of head scaly; pectoral rays all simple; size large; nasal spine moderate, distant from eye ..... *Merinthe*
KK.—No palatine teeth; head strongly spinescent.
P.—Upper pectoral rays branched.
Q.—Head and prepectoral region scaly; occipital depression marked. *Scorpaenopsis*
QQ.—Few scales on head and opercle; prepectoral region and front of belly naked ..... *Scorpaenopsella*

PP.—All pectoral rays simple; supraorbital tentacle very long ..... *Nemapontinus*

JJ.—No teeth present; size small, head very large, with long concave snout ..... *Hipposcorpaena*

FF.—Pectoral rays much elongated; 12 to 14 very venomous dorsal spines, usually elongate and largely free; ectethmoid and vomer widely separated; no palatine teeth.

R.—Pectoral rays all simple, the upper ones largely free or the membrane deeply and obliquely notched; 3 anal spines..... *Pterois*

RR.—Pectoral with several upper rays divided, their tips little or not at all free, and not extending upon the caudal.

S.—Dorsal spines XIII; no elongate preorbital barbel.

T.—Caudal rounded, its upper and lower rays not prolonged; dorsal spines much shorter than depth of body; anal spines 3.

U.—Dorsal spines largely free, equal to dorsal rays in height; ridges of head spiny; pectoral I to IV–5 to 9–VII to X. *Dendrochirus*

UU.—Dorsal spines shorter than dorsal rays, only their tips free; ridges of head serrulate; pectoral II–6–VI. *Brachypterois*

TT.—Caudal truncate, its top and bottom rays each prolonged into a thread; spinous dorsal higher than body depth; 2 anal spines ..... *Parapterois*

SS.—Dorsal spines XIV; preorbital barbel extends to pectoral; dorsal spines higher than soft dorsal and largely free; head spiny; anal spines 3 ..... *Nemapterois*

FFF.—Dorsal spines 11, their membrane entire; soft dorsal separated by a deep notch; no palatine teeth; pectoral rays all simple; anal spines 2. *Pteroidichthys*

EE.—Lateral line incomplete, on only 4 or 5 anterior scales ..... *Phenacoscorpius*

DD.—Bones of head cavernous, with large muciferous cavities; scales cycloid; the lateral line in a broad scaleless groove.

V.—Anal spines 2; depth 4 to 4.4 times in the length. *Macroscorpius*

VV.—Anal spines 3; depth 2.4 to 3.5 times in the length ..... *Setarches*

CC.—Pectoral fin elongate, its lowermost ray detached as a separate feeler; chin with barbels ..... *Apistus*

BB.—Body naked; dorsal spines 12, nearly separate from soft dorsal, membrane of spines deeply incised; pectoral rays all simple; no palatine teeth. ..... *Scorpaenella*

AA.—Origin of dorsal above, or before, or just behind eye.

a.—Dorsal continuous and undivided; jaws, vomer, and palatines with teeth.

b.—Chin without barbels.

c.—Body scaled.

d.—Dorsal attached to caudal, its origin before eye, with 15 to 17 spines; the first spine pointed forward, the second to fourth or fifth spines divergent and elevated to form a crest, the fin continuous, not incised; scales minute, cycloid, more or less embedded; body strongly compressed; branchiostegals 5 ..... *Amblyapistus*

dd.—Dorsal not attached to caudal, its origin above eye, with 12 to 15 spines, the 4 or 5 anterior ones strongly divergent, not elongate, their membrane deeply incised, all spines with free tips; scales minute, embedded; body strongly compressed; branchiostegals 6....*Paracentropogon*

cc.—Body naked, minute soft prickles may be present; dorsal origin above or just behind eye; dorsal spines 12 to 14, the 4 anterior ones strongly divergent but not elevated, the fin membrane more or less deeply incised; branchiostegals 7 ..... *Gymnapistes*

bb.—Chin with 2 barbels; skin naked, with more or less evident transverse striae; dorsal origin above eye, spines 13, the first pointing forward, the second and third elevated to form a crest, the fin not incised ..... *Tetraroge*

aa.—Dorsal more or less divided, the first 3 or 4 spines completely detached or set off from the rest of the fin by a notch.

e.—The 3 anterior dorsal spines nearly or entirely separated from the rest of the fin; spinous dorsal much longer than soft dorsal.

f.—Body with minute, non-imbricate scales imbedded in the skin; palatine teeth present; preorbital with one backward-projecting spine; dorsal III–XII–7; anal III–4 or 5; ventral I–4 or 5. ..... *Prosopodasys*

ff.—Body naked; no palatine teeth; preorbital with 2 strong spines extending back far past eye; dorsal III–IX–8; anal I–7, the spine short and feeble ..... *Acanthosphex*

ee.—The 3 anterior dorsal spines form a more or less distinct division but are never separate or nearly so from the rest of the fin; no scales; spinous dorsal much shorter than soft dorsal; all fin rays are simple.

g.—Preorbital with 2 sharp spines, the posterior one extending upon the maxillary; preopercle with 4 sharp spines; dorsal VII–15 to 18, the first spine longest, membrane notched between first and third spines; anal II–14 or 15;

ventral I–2; skin covering dorsal, anal, ventral, and caudal base; chin with short filaments ..... *Aploactoides*

gg.—Preorbital with 2 blunt spines, never sharp; preopercle with 4 or 5 stout blunt spines; dorsal III–IX to XI–10 or 11, the 3 anterior spines separated by a notch or elevated and thus set apart; anal I or II, 8 to 10; ventral 1–3; skin with minute velvety prickles ..... *Cocotropus*

Genus SCORPAENODES Bleeker

Scorpaenodes Bleeker, Nat. Tijds. Ned. Ind. 13 (1857) 371, type *Scorpaena polylepis* Bleeker; Fowler, Marine Fishes West Africa (1936) 1307; Matsubara, Sigenk. Kenky., Trans. No. 2 (1943) 274.

Sebastopsis Gill, Acad. Nat. Sci. Phil. Proc. (1862) 278, type *Sebastes polylepis* Bleeker; Bleeker, Verh. Akad. Amsterdam 16 (1876) 21; Jordan and Evermann, U. S. Fish. Comm. Bull. 23 (1905) 462.

Small, violently-stinging fish lurking in holes and crevices on coral reefs; species few, widely distributed in the tropical Indo-Pacific.

This genus is separated from Sebastodes by its lack of palatine teeth. Body oblong, laterally compressed, covered with medium ctenoid scales, which cover the head above and on the sides; jaws naked. Head armed with spiny crests; no occipital depression; opercle with 2, preopercle with 3 to 5 marginal spines. Dorsal and anal fins scaled basally; dorsal XIII–7 to 9, anal III–3 to 6; pectoral II–5 to 7–11; ventral I–5. Branchiostegals 7.

Interorbital space deeply concave; supraocular and parietal ridges well developed; frontal ridges each ending in a sharp spine; cranial spines sharp and strong, directed upward and backward; preocular, supraocular, postocular, tympanic, parietal, and nuchal spines present; coronal spines sometimes present; 4 or 5 preopercular spines and 2 opercular spines. Air bladder present, neither constricted nor bilobed. Pyloric caecae 3 to 5, tubular.

Key to the Philippine species of Scorpaenodes

A.—Second anal spine little more than half the length of the anal when depressed, and 2 to 2.5 times in head ..... *S. guamensis*

AA.—Second anal spine nearly as long as or longer than depressed anal, 1.5 to 1.75 in head ..... *S. scabra*

SCORPAENODES GUAMENSIS (Quoy and Gaimard) **Guam stinging fish**

Scorpaena guamensis Quoy and Gaimard, Voy. *Uranie*, Zool. (1824) 326, Guam; Günther, Fische der Südsee 1 (1875) 74, *plate 56, fig. B*, Carolines, Samoa, Tonga, Pelew Islands, Society Is.

Sebastopsis guamensis Streets, U. S. Nat. Mus. Bull. 7 (1877) 76, Samoa; Fowler, Acad. Nat. Sci. Phil. Proc. (1900) 521, Tahiti; Jordan and Seale, U. S. Bur. Fish. Bull. 25 (1906) 374, Apia,

Samoa; Jordan and Richardson, U. S. Bur. Fish. Bull. 27 (1908) 279, Calayan, Babuyan Islands, north of Luzon; McCulloch, Austral. Mus. Records 9 (1913) 388, Samoa, New Hebrides, Tongatabu, Bougainville Island, Duke of York Island; Fowler, Copeia No. 58 (1918) 65, Philippines.

Sebastes guamensis M. Weber, *Siboga* Exped. Fische 57 (1913) 490, Sanguisiapo, Sulu Archipelago.

Sebastapistes guamensis Seale, Bernice P. Bishop Mus. Occ. Papers 4 (1906) 80, Tahiti; Nukahiva, Marquesas Islands; Fate, New Hebrides; Shortland Island, Solomons.

Scorpaenodes guamensis Fowler, Acad. Nat. Sci. Phil. Proc. 79 (1927) 288, Philippines; Padang, Sumatra; Herre, Bur. Sci. Coll. 1921–26; Puerto Galera, Mindoro; Tubigan and Sibutu, Sulu Prov.; Fowler, Bernice P. Bishop Mus. Mem. 10 (1928) 289, Tahiti; Apia and Pago Pago, Samoa; Shortland Island; Faté; Guam; Herre, Fishes 1931 Phil. Exped. (1934) 65, Culion; Nasugbu, Batangas Prov., LUZON; Sitankai, Sulu Prov.; Herre, Field Mus. Nat. Hist., Zool. Ser. 21 (1936) 261, Wala Island and Malo Island, New Hebrides; Maraa, Tahiti; Herre, Fishes 1936–37 Exped., Nasugbu, Batangas Prov., Luzon; Dumaguete, Negros Oriental Prov.; Sitankai, Sulu Prov.; Herre, Collection of 1948, Taal and Nasugbu, Batangas Prov., Luzon; Cebu, Cebu Prov; Dumaguete; Matsubara, Sigenk. Kenky. Trans. No. 2 (1943) 278, figs. 92–93, Hatizyozima and Iriomotezima, Japan; Riukiu, Itoman, Okinawa-honto, and Kowan, Riu Kiu Islands; and Pelew Islands; Herre, Phil. Coll. of 1948, Taal and Nasugbu, Batangas Prov., Luzon; Cebu, Cebu Prov.; and Dumaguete.

Sebastes (*Sebastopsis*) *guamensis* de Beaufort, Bijdr. Dierk., Amsterdam 19 (1913) 148, Saonek, New Guinea.

Scorpaena polylepis Bleeker, Nat. Tijds. Ned. Ind. 2 (1851) 173.

Scorpaenopsis polylepis Bleeker, ibid. 12 (1859) 353, Bawean.

Scorpaenichthys polylepis Bleeker, ibid. 12 (1856–57) 232, Batu Is.

Scorpaenodes polylepis Bleeker, ibid. 13 (1857) 371, Sangi Island, Sangir Islands.

Sebastopsis polylepis Gill, Acad. Nat. Sci. Phil. Proc. (1862) 278; Bleeker, Verh. Akad. Amsterdam 16 (1876) 21, *plate 4, fig. 2*, Manado and Gorontalo, Celebes; Sangi Island, between Celebes and Mindanao; Ternate; Buru; Ceram; Amboina; Goram; Aru.

Sebastes polylepis Günther, Cat. Fishes 2 (1860) 106, Amboina, East Indies; Meyer, Soc. España Hist. Nat. Madrid Anal. 14 (1885) 20, Cebu, Cebu.

Sebastes minutus Cuv. and Val., Hist. Nat. Poiss. 4 (1829) 255, Moluccas, Marianas, Society Islands.

Sebastopsis erinacea Garman, Mus. Comp. Zool. Bull. 39 (1903) 231, *plate 1, fig. 2*, Viti Levu, Fiji.

This little stinging fish is found over most of the tropical Indo-Pacific. First collected at Guam, it occurs throughout Micronesia and Polynesia to the Marquesas, south to tropical Australia, and westward to the Red Sea. It lives on reefs, under and around coral heads.

Dorsal XIII–8 or 9, rarely 7, but one specimen has only 5 rays; anal III–5 or 6; pectoral I–7–XII or II–5 or 6–XI; ventral I–5; scales in longitudinal series 38 to 42, plus 3 more on the caudal base; 22 to 26 tubulated scales in the lateral line, plus 1 on caudal base; 5 above and 11 or 12 below the lateral line; 20 to 24 predorsal scales, counted to middle of interorbital; gill rakers 6 plus 8.

Depth 2.6 to 2.8, caudal 3.6 to 4, head 2.3 to 2.5 times in the length; eye 3.3 to 3.5, snout 3.5 to 4, interorbital 5 to 6.2 times in the head. The body is oblong, compressed, the dorsal profile strongly convex; scales ctenoid, cheeks and opercles scaled; eyes high up, projecting above the profile, the interorbital concave; maxillary usually extending to hind margin of eye, its posterior extremity expanded and equal to five-eighths to seven eighths of the eye. The pectoral extends as far as the anus, 3.25 to 3.7 in the length, the ventral 3.3 to 3.5 times. The fifth to ninth dorsal spines are longest, 2.54 to 3, the longest ray 2.1 to 2.3 times in the head; the second anal spine largest, 1.8 to 2.5 in the head, the longest anal ray 1.9 to 2.15.

Cranial spines all erect, sharp, and well developed; 3 supraocular, and a pair of postocular spines; tympanic, parietal temporal, nuchal, suprascapular, sphenotic, pterotic, and humeral spines present; nasal spines minute or absent. Preorbital with a keel above, ending in a sharp spine, its lower lobe bluntly rounded, without spine; suborbital stay with 2 consecutive longitudinal keels, each ending in a sharp spine; 3 strong spines on the hind margin of the preopercle, the uppermost one sharpest and strongest, with a basal accessory spine; opercle with 2 strong sharp flat marginal spines; no coronal spine.

A simple flat or bifid tentacle on the upper anterior part of the eyeball; simple cirri may be attached to various spines on the head; 2 are usually present above the eye; the dorsal membrane behind each dorsal spine may be prolonged into a filament. Often specimens have no cirri or tentacles at all.

The color in life is usually rich dark reddish to dusky brown, with 3 or 4 darker cross bands, and sprinkled with brown spots; usually a dusky brown band on the caudal peduncle, followed by a whitish bar on the caudal base; a deep reddish brown spot on the opercle; fins all mottled reddish brown, or a network of reddish brown and gray; underside usually mottled and spotted with brown, the preventral area and underside of the head sometimes paler.

In alcohol the reddish tints disappear but the general pattern of coloration is little changed.

This pretty but violently stinging little fish seldom attains a length of 100 mm, though Bleeker had one of 105 mm. It occurs on coral reefs everywhere in the Philippines, having been taken from the Babuyan Islands to the extreme southern tip of the Sulu Islands.

Here described from 3 specimens 35 to 66 mm in length, collected at Nasugbu and 5 from 50 to 70 mm, taken at Taal, Batangas Province, Luzon; one of 61 mm from Cebu, Cebu Province and 8 from 39 to 79 mm, collected at Dumaguete.

SCORPAENODES SCABRA (Ramsay and Ogilby).

Sebastes scaber Ramsay and Ogilby, Linn. Soc. New South Wales, Proc. 10 (1885) 577, Shark Reef, Australia.

Sebastopsis scabra Jordan and Seale, U. S. Nat. Mus. Proc. 28 (1905) 791, Bais, Negros Oriental Prov., Philippines; Jordan and Seale, U. S. Bur. Fish. Bull. 25 (1906) 374, *fig. 71*, Apia and Pago Pago, Samoa; Jordan and Seale, U. S. Bur. Fish. Bull. 26 (1907) 37, Cavite Prov., Luzon; Samoa; Evermann and Seale, U. S. Bur. Fish. Bull. 26 (1907) 102, Bacon, Sorsogon Prov., Luzon, Philippines; Kendall and Goldsborough, Mus. Comp. Zool. Mem. 26 (1911) 314, Bora Bora, Society Islands; Kusaie, Caroline Islands.

Scorpaenodes scabra Fowler, Bernice P. Bishop Mus. Mem. 10 (1928) 290, Apia, Samoa; Kusaie and Ponape, Caroline Islands; Ebon Island, Marshall Islands; Tahiti; Guam; Faté; Herre, Field Mus. Nat. Hist., Zool. Ser. 21 (1936) 262, Tahiti; Ovalau and Nukulau Islands, Fiji; Malo Island, New Hebrides; Herre, Pan-Pac. Research Inst. Jour. 8 (1933) 9, Dumaguete, Negros Oriental Prov., Philippines; Herre, Fishes 1931 Phil. Exped. (1934) 65, Dumaguete; Punta Flecha, Zamboanga Prov., Mindanao; Fowler, Acad. Nat. Sci. Phil. Monogr. 2 (1938) 174–290, Bora Bora and Tahiti, Society Islands; Matsubara, Sigenk. Kenky. Trans. No. 2 (1943) 281, *fig. 94*, Iriomote-zima, Riukiu Islands.

Known from Australia to the Philippines, Caroline and Marshall Islands, and eastward to Bora Bora and Tahiti.

Dorsal XIII–8 or 7; anal III–5, rarely 4 rays; pectoral II–4, 5, or 6–XII or X; ventral I–5; gill rakers 5 plus 7. Scales in longitudinal series above lateral line 38 to 42, plus 2 on the caudal base; 5 scales above and 11 or 12 below the lateral line.

Depth 2.6 to 2.75, head 2.3 to 2.45, caudal 3.7 to 3.8, pectoral 2.5 to 2.7 in the length. The eye equals or exceeds the snout in length, 2.9 to 3.7, the snout 3.45 to 3.8, the interorbital 5.6 times in the head. Mouth large, oblique, the maxillary reaching opposite the center of the eye, its expanded posterior end less than half the eye. Fourth and fifth dorsal spines longest, 2.5 to 2.6, longest dorsal ray 2.2 to 2.35, second anal spine very

long and strong, 1.55 to 1.8, longest anal ray 1.9 to 2 times in the head. The second anal spine reaches to the tip or beyond of the depressed anal fin.

A small nasal spine, 3 supraocular spines; tympanic, sphenotic parietal, temporal, pterotic, and humeral spines present; no coronal spines. Preorbital with a sharp backward-pointed spine on its lower lobe, upper surface with a short keel ending in a sharp spine; suborbital keeled, with 2 spines; hind margin of preopercle with 2 or 3 spines, the upper one strong and sharp, preceded by an accessory spine; opercle with two strong flat spines.

In life the color is reddish brown, with 4 irregular oblique dark brown cross bands on head and body and a dark brown cross bar on the caudal peduncle; opercle with a large black circular spot; all fins are barred or blotched with brown and white or pale spots.

The only Philippine specimen obtained in 1948 was one of 45 mm taken from the reef at Siluag Island, Sulu Province. Some of the Dumaguete and Cebu specimens are intermediate between *S. scabra* and *S. guamensis,* but I have placed them all under the latter name.

This fish which reaches a length of 95 mm, swarms on the coral reefs of the Society, Samoan, and Fiji Islands. In the Philippines typical specimens have been taken from Manila Bay and Sorsogon Province, Luzon; Calapan, Mindoro; Bais and Dumaguete, Negros Oriental Province; Zamboanga and Punta Flecha, Zamboanga Province, and Samal Island, Davao Province, Mindanao; Tonkil, Tubigan, and Bongao Islands, Sulu Province.

Genus HYPOMACRUS Evermann and Seale

Hypomacrus Evermann and Seale, U. S. Bur. Fish. Bull. 26 (1907) 101, type *Hypomacrus albaiensis* Evermann and Seale.

A Philippine genus with one species known.

"This genus is related to *Sebastopsis* Gill, from which it differs in having the tenth to thirteenth pectoral rays much produced. The upper 9 rays are subequal, their length half that of head; length of tenth ray 1.2 in head, the eleventh to thirteenth successively shorter, the last 3 usually shorter than the upper 9, and not detached."—Evermann and Seale.

HYPOMACRUS ALBAIENSIS Evermann and Seale

Hypomacrus albaiensis Evermann and Seale, U. S. Bur. Fish. Bull. 26 (1907) 102, *fig. 20.*

A Philippine species, only known from the original collection.

Head 2.25 in length without caudal; depth 3.25; eye 3.75 in head; snout 3.75; interorbital 2 in snout; dorsal XIII, 9 (the cotype has the soft dorsal deformed, with only 5 rays); anal III, 5; scales 5–26–13, about 16 tubules in lateral line.

Body moderately compressed, the head rather elongate, the lower jaw projecting, depth of caudal peduncle 4.1 in head; maxillary 2 in head, the distal end under the posterior margin of pupil, its distal width 1.5 in eye; mandible 1.75 in head; villiform teeth on jaws and vomer, none on palatines; gillrakers very small, 8 on lower limb of first arch; spines of head as follows: opercular 2; preopercular 2, the upper the larger, with a small superimposed spine on its base; bony stay across cheek with 2 spines, 4 above eye, 5 on each side of nuchal region; a distinct fringed orbital tentacle equal in length to pupil; a short dermal flap at base of each nuchal spine; a branched flap at nostril, and a rather long preorbital flap hanging over maxillary.

Body entirely scaled, head scaled; origin of dorsal above axil of pectoral, longest spine 3.2 in head; origin of anal under origin of soft dorsal, its longest ray 2 in head, the second anal spine the longest and strongest, 2.3 in head; origin of ventrals about midway between tip of upper jaw and origin of anal, their length 1.85 in head, their tips falling far short of anal; pectoral peculiar, the 9 upper rays short, about 2 in head, their tips scarcely extending past tips of ventrals; the lower part of fin elongate, composed of 7 simple rays, the longest 1.19 in head, their tips beyond line with origin of anal fin; caudal rounded, 1.65 in head.

Color in spirits, mottled brownish, a large yellowish area occupying entire upper two-thirds of opercle, extending to eye anteriorly, and posteriorly extending down and covering base of pectoral; a round black opercular spot posterior of and between the preopercular spines; about 5 indistinct rather narrow dark bands over back; spinous dorsal with irregular dusky markings, soft dorsal with dark base and tip, the mid portion whitish; anal with irregular dark markings, the most distinctive being a black spot on posterior axil of fin; ventrals shaded with dusky dots posteriorly; pectoral with brown dots on the short rays, the elongate rays white with a few scattered brown dots; caudal dusky at tip, a slight dusky wash on base of rays.

Type, No. 55902, U. S. National Museum, 2.5 inches long; cotype, No. 20006, Stanford University, 2.25 inches long. Both

were collected at Bacon, Sorsogon Province, Luzon, by Mr. Charles J. Pierson, in 1903.

Genus SEBASTISCUS Jordan and Starks

Sebastiscus Jordan and Starks, U. S. Nat. Mus. Proc. 27 (1904) 124, type *Sebastes marmoratus* Cuvier and Valenciennes; Matsubara, Sigenk. Kenky. Trans. No. 2 (1943) 252.

Japan to the East Indies.

Differs from *Sebastodes* in having only 12 spines in the dorsal fin. From *Helicolenus* it is separated by having an air bladder. Peritoneum pale. Scales ctenoid. Two species are known. Both are abundant in Japan, and one ranges south to Hong Kong and Luzon.

SEBASTISCUS MARMORATUS (C. and V.)

Sebastes marmoratus Cuvier and Valenciennes, Hist. Nat. Poiss. 4 (1829) 345, Japan; Schlegel, Fauna Japonica, Poiss. (1843) 46, *plate 21, figs. 1–2,* Nagasaki; Richardson, Ichthy. China Japan (1846) 215; Günther, Cat. Fishes 2 (1860) 104, Japan China; in part; Kner, Reise *Novara,* Zool., Fische (1865) 114, Manila Luzon, Philippines; Java, the last perhaps an error for Japan.

Sebastichthys marmoratus Bleeker, Verh. Akad. Amsterdam 16 (1876) 16, Java; Manila, Luzon; in part.

Helicolenus marmoratus Jordan and Snyder, Annot. Zool. Jap. 3 (1901) 98, Hakodate; Jordan and Snyder, U. S. Nat. Mus. Proc. 23 (1901) 575, Tusima; Yokohama.

Sebastiscus marmoratus Jordan and Starks, U. S. Nat. Mus. Proc. 27 (1904) 124, Hakodate, Same, Tokyo, Misaki, Sagami Bay, Enoshima, Suruga Bay, Kobe, Hiroshima, Wakanoura, and Nagasaki; Snyder, U. S. Nat. Mus. Proc. 42 (1912) 427, Hakodate; Tokyo; Misaki; Nanao; Kagoshima and Nagasaki markets; Schmidt, l'Acad. Sci. l'URSS. Bull. (1931) 116, Obama; Nagasaki; Hong Kong; Herre, Hong Kong Naturalist, supp. 3 4 (1934) 33, Hong Kong; Matsubara, Sigenk. Kenky. Trans. No. 2 (1943) 254, *fig. 84,* many Japanese localities; also Hong Kong and Chusan, China.

Scorpaena marmorata Tortonese, Mus. Zool. Univ. Torino. Bull. 47 Ser. 3 (1939) 181, Yokoma.

Sebastiscus tsuraara Tanaka, Annot. Zoolog. Jap. 29 (1917) 7, Misaki, Japan.

Sebastes sinensis McClelland, Calcutta Jour. Nat. Hist. 4 (1844) 397, *plate 21, fig. 3,* Chusan, China.

Sebastes cressispinus Steindachner and Döderlein, Kenkschrift. Akad. Wiss. Wien (1884) 32, Tokyo.

Common from Japan to Hong Kong and Formosa, with one Philippine record. No doubt occurs along the Ilokano coast of Luzon and in the Batanes Islands.

Dorsal XII–11 to 13, mostly 12; anal III–5 or 6; pectoral I–8–IX or I–9–VIII; 13 to 15 on lower limb. About 90

scales in a longitudinal series, just above the lateral line, and 10 or 11 between the lateral line and the median dorsal spines; gillrakers 19 to 25, usually 23.

Head 2.4, depth 2.83 in length; eye 4.25, maxillary 2.25 times in the head; interorbital width twice in the diameter of the eye, concave and scaleless.

The oblong body is laterally compressed, the ventral profile more curved than the dorsal. Jaws subequal or the lower slightly included; teeth on vomer and palatines; maxillary reaching almost below hind rim of eye.

Cranial spines high and sharp; nasal, preocular, supraocular, postocular, tympanic, coronal, parietal, and nuchal spines present; occipital ridges high; preorbital with a spine on its posterior lower edge, and 2 very low anterior lobes; the 3 upper preopercular spines directed backward, the second one largest, the 2 lower spines pointed downward and backward; opercle with 2 flat spines; interorbital deeply concave.

Scales ctenoid except on breast; pectoral with scales on basal half of median rays; other fins except ventrals with fine basal scales. Caudal truncate or very slightly rounded.

The color of preserved specimens is reddish brown, or dark brown clouded with deep dusky or blackish, the belly much paler or white; 5 pale spots along the back at the dorsal base, the last on the caudal peduncle; fins marbled with brown and white; sometimes the sides are sprinkled with ocellated white spots. Reaches a length of 337 mm.

A common shore fish, and abundant in markets from Hakodate and Tokyo to Hong Kong.

SCORPAENA (Artedi) Linnaeus

Scorpaena (Artedi) Linnaeus, Syst. Nat., ed. X (1758) 266, type *Scorpaena porcus* L.; Jordan and Evermann, Fishes North and M. America 2 (1898) 1839; Matsubura, Sigenk. Kenky. Trans. No. 1 (March, 1943) and No. 2 (August, 1943) 290.

Parascorpaena Bleeker, Versl. Akad. Amsterdam 9 (1876) 295, type *Scorpaena picta* Cuv. and Val.

Pseudosebastes Sauvage, Mus. Hist. Nat. Paris Nouv. Arch. 2 (1866) 115, type *Sebastes bougainvillei* Cuv. and Val.

Scorpion fishes. Found in all warm seas.

The oblong body is more or less compressed; the large head little compressed, with spinous ridges, bearing numerous spines, those on top usually erect; tentacles, skinny flaps, and filaments usually present on spines, nostrils, above eye on jaws, and along the lateral line. Mouth large, with villiform teeth in jaws and

on vomer and palatines. Nape with a quadrilateral depression more or less developed. Scales ctenoid, those on top of head cycloid, or wanting. Snout, lower jaw, and underside of head naked.

Dorsal continuous, more or less deeply notched, XI–I–9 or 10; anal III–4 or 5; pectorals large, rounded, of both simple and divided rays, or rarely all simple, no free pectoral rays; ventrals thoracic, inserted behind pectorals, I–5. No air bladder. Branchiostegals 7.

Species numerous in tropical seas, often brightly colored. Called scorpion fishes because of their violently stinging spines. Those known from the Philippines are all small, the largest but 202 mm in length. All but one species were taken by the *Albatross* from 1907 to 1909, and were described by H. W. Fowler. His species seem to be sufficiently distinct, but it is possible that some are only the juvenile stage of another fish. They live at or near the bottom, and occur at various depths up to 215 fathoms.

Key to the Philippine species of Scorpaena

The preparation of a key without an opportunity to examine specimens is, of course, both difficult and unreliable. It is made less dependable by the discrepancies between Fowler's descriptions and his figures. In making the key, scale counts of the figures have been followed, rather than the statements in the text. The longitudinal series of scales is counted just above the lateral line. As the rows are more or less irregular, the scale count is variable.

A.—Scales on head, pectoral base, prepectoral and preventral areas; pectoral rays both divided and simple.
  B.—Scales in longitudinal series 26 to 30.
    C.—Scales 26 to 28, with 4 above and 9 below lateral line; pre-dorsal scales 10; pectoral I–9–X ..... *S. megalepis*
    CC.—Scales 28 to 30, 5 above and 8 below lateral line; 7 predorsal scales; pectoral II–4–XI ..... *S. gibbifrons*
  BB.—Scales more than 30.
    D.—34 to 36 scales in longitudinal series, 6 above and 10 below lateral line; 6 predorsal; pectoral I–9–X or II–8–IX *S. kaufmani*
    DD.—Scales 40 or more.
      E.—Scales 40 to 44, 7 above and 11 below lateral line; 10 predorsal; pectoral II–7 or 8–XI ..... *S. amplisquamiceps*
      EE.—Scales about 40, 5 above and 12 below lateral line; 17 (?) predorsal scales; pectoral 1–8 or 9–IX or X *S. pallidimacula*

AA.—Head, prepectoral area and pectoral base naked.

G.—Ventral region back to front of belly naked; 38 (?) scales in longitudinal series; 5 above and 14 below lateral line; 6 predorsal scales; pectoral I–7–XI ..... *S. hemilepidota*

GG.—Preventral area with small scales; no predorsal scales; 36 to 37 scales in lateral series; 4 above and 10 below. All pectoral rays simple ..... *S. taeniophrys*

SCORPAENA MEGALEPIS Fowler

Scorpaena megalepis Fowler, U. S. Nat. Mus. Proc. **85** (1938) 56, *fig. 22*, Philippines in 34 to 45 fathoms, and China Sea, near Hong Kong, in 37 fathoms.

A fish of the Philippines and China Sea.

Dorsal XII–9 or 10; anal III–5; pectoral I–9–X. Scales 26 to 28 close above lateral line; 4 scales above and 9 below lateral line; 10 predorsal. Scales on pectoral base, behind and below eye, and on upper part of opercle much smaller than on trunk. Gillrakers 5+12.

Depth 2.45, head 2.1, the rounded caudal 3.4 times in the length, according to the figure; caudal 1.8 in the head. Fowler gives the depth 2.75 to 3.6, head 2 to 2.125 in the length. Eye large, greater than snout in the young, subequal with age, about 3.5 in head in the figure, but 3.3 to 4.2 according to Fowler.

A pair of nasal spines; pair of antero-supraorbital spines and 3 pairs of postero-supraorbital spines, followed by a pair of occipitals and a pair of nuchals; occipital depression slight; 3 postocular spines, a small suprascapular spine; small inconspicuous tympanic spine close over third postocular spine; 2 preorbital spines, posterior one larger and directed a little backward; suborbital stay with 4 spines; 4 preopercular spines, upper largest, with a small basal spine; 2 widely divergent opercular spines; humerus with broad rounded keel, without spine.

A filament nearly equal to eye on supraorbital spine; also long fringed flap at posterior preorbital spine.

Color brownish, mottled with darker on back and sides, paler to whitish beneath; median row of dark blotches on spinous dorsal, a subbasal dark band on soft dorsal, and a transverse median dark band on anal. Largest specimen 98 mm long.

After Fowler.

SCORPAENA GIBBIFRONS Fowler

Scorpaena gibbifrons Fowler, U. S. Nat. Mus. Proc. **85** (1938) 58, *fig. 23*, off Cabugan Grande Island, between Samar and Leyte near Surigao Strait, in 67 fathoms.

A Philippine species.

Dorsal XII–9; anal III–5; pectoral II–4–XI. Scales 28 according to Fowler but 32 in figure, above course of lateral line; 5 above to spinous dorsal, 8 below; 7 predorsal scales. Preventral and pectoral scales and those behind eye much smaller than elsewhere. Gillrakers 6+12.

Depth 2.6, head 2.1, the rounded caudal 3.95 in the length; the large prominent eye is 3 in the head (3.6 in text) and much longer than the snout. Pectoral reaching to vertical above second anal spine, 1.6 in head.

A pair of small nasal spines; pair of small antero-supraorbital and 3 pairs of postero-supraorbital spines, followed by pair of occipitals and nuchals, the latter much the longest; 2 small spines on hind orbital edge, followed by 2 large postocular spines and a suprascapular; 2 preorbitals, the posterior one larger and pointing downward and backward; suborbital stay with 3 spines; 5 preopercular spines, the uppermost longest and with a small prebasal spine; 2 wide-set opercular spines, the upper one much larger than the other; a broad strong humeral spine. A fimbriate tentacle over eye.

Color pale brown, blotched with darker; fins all pale.

Only the type known, its length 89 mm.

After Fowler.

SCORPAENA KAUFMANI Herre, new species

Dorsal XII–9; anal III–5 or 4; pectoral I–9–X and II–8–IX; 22 or 23 scales with tubes in lateral line; 34 to 36 scales in longitudinal series close above lateral line; 6 above to middle of spinous dorsal, 10 below to anal origin; 6 predorsal scales to nape, plus 5 more to interorbital; gillrakers 5+7.

Body laterally compressed; the head large, its spines moderate or small; depth 2.86, head 2.15, the caudal 3.58 in the length. The eye is large, 3⅓ times in the head; the breadth of the grooved narrow interorbital is about a third of an eye diameter. Occipital depression very slight. The deeply notched snout is 4 times in the head.

Scales on opercles, preopercles, postocular, predorsal, and preventral region smaller than on trunk. A pair of very small nasal spines; a preocular, supraocular, and postocular spine on each orbital ridge; 2 preorbital spines, the small anterior one pointing downward, the posterior one much larger and pointing diagonally backward and downward; coronal ridge not terminating in a spine; no postorbital spine; s small tympanic spine; 2 small sphenotic spines; a moderately stout pterotic,

postfrontal, and parietal spine on each side; 4 spines on the suborbital ridge; 3 to 4 preopercular spines, the large uppermost one with a small accessory spine at its base; 2 divergent opercular spines; humeral spine very small and blunt; 2 small posttemporal spines on each side.

Dorsal deeply notched behind the eleventh spine, the dorsal membrane deeply incised on the first 8 or 9 spines so that more than a third of each spine is nearly free; first dorsal spine very short, twice in the eye or three times in the fourth dorsal spine, which is 2.2 in the head; longest dorsal ray equal to highest dorsal spine; second anal spine a very little shorter, and equal to longest anal ray. Pectoral extending midway between anal opening and origin of anal fin, a little more than 1.5 in the head or 3.58 times in the length; least depth of caudal peduncle 4 in the head; ventral reaches to the anus; twice in the head. A broad tentacular flap behind the posterior spine, and a small one behind the anterior spine of the preorbital; two flaps at the upper preopercular spine; a small nasal flap; a small simple tentacle behind the lower opercular spine, and 8 or more simple hair-like cilia on the free margin of the opercle. No ocular tentacle.

Color in preservative pale brownish, darker above; evidently with some dusky blotches on the back in life. Dorsal shaded with dusky.

The type, 86 mm long, was taken in 65 fathoms, at the entrance to Manila Bay, Luzon. A specimen 56 mm long, taken by a commercial trawler in 35 fathoms in Manila Bay, seems to belong here. The vertical fins, pectoral, and tip of the caudal are dusky.

A specimen 74 mm long, taken between Monja island and Corregidor, at the entrance to Manila Bay in 30 fathoms, seems to belong here, though it is undoubtedly close to *Scorpaena pallidimacula* Fowler.

Dorsal XII–9; anal III–4; pectoral I–8, —X. Scales 36 in longitudinal series. Depth 2.84, head 2.11 in length; eye 3.2, snout notched, with a prominent symphyseal knob, 5 times in the head. An elongate tentacle above the eye, one and three-eights times in an eye diameter, or 4.375 in the head. There is a dusky longitudinal band on the spinous dorsal; the other fins all pale.

Named for my young colleague, Donald Kaufman, enthusiastic and painstaking student of fishes.

SCORPAENA AMPLISQUAMICEPS Fowler

Scorpaena amplisquamiceps Fowler, U. S. Nat. Mus. Proc. 85 (1938) 55, *fig. 21*, Verde Island Passage and Batangas Bay, Batangas Prov., Luzon, in 100 fathoms. Also from Philippine seas, in 100 to 161 fathoms.

A Philippine species.

Dorsal XII–9; anal III–5; pectoral II–7or8–XI. Scales 33 to 37 in Fowler's description, but 44 in his figure, 7 above and 11 below lateral line. Predorsal scales 10; scales on pectoral base, prepectoral, and preventral areas much smaller than elsewhere. Occiput with very shallow depression. Gillrakers 5+10.

Depth 3 to 3.2, head 2.125 to 2.25, the rounded caudal 3.6 to 3.7 in the length; the eye equals the snout, 3.9 to 4.1 in the head. The pectoral extends to a vertical above the anal origin, 1.75 to 1.85 in the head. The first dorsal spine is very short, its height a third of the eye diameter and 5 times in the third spine, which is higher than any other spine and equals the longest soft dorsal rays.

A pair of nasal spines; a pair of antero-supraorbital spines and 3 pairs of postero-supraorbital spines, followed by occipital and nuchal pair; a very small supero-postorbital spine, followed by 2 large spines; 2 preorbital spines, both pointed backward; suborbital stay with 4 spines, the first being on the preorbital bone; 4 preopercular spines, the upper one longest and with a small prebasal spine; 2 wide-set opercular spines; a rather blunt humeral spine. A supraocular filament and a filament at each preorbital spine.

Color brown, mottled with darker and paler; fins pale, the spinous dorsal blotched with darker.

Length of the type 152 mm.

After Fowler.

SCORPAENA PALLIDIMACULA Fowler

Scorpaena pallidimacula Fowler, U. S. Nat. Mus. Proc. 85 (1938) 61, *fig. 25*, Uanivan Island, Pujada Bay, Davao Prov., Mindanao, in 215 fathoms.

A Philippine species.

Dorsal XI–I–10; anal III–5; pectoral rays I–8or9–IX or X; 40 scales in lateral series close above lateral line, 5 scales above and 12 below; 17(?) predorsal scales to eye. Scales on pectoral base, prepectoral, and preventral area, and caudal base smaller than elsewhere. Gillrakers 7+12.

Depth 2.8, head, 2, the rounded caudal 4.1 times in the length, in Fowler's figure. His text gives the depth as 3 in length. Eye 3.5 in head and slightly more than snout, though Fowler says snout is "over twice eye diameter."

A pair of small nasal spines; a pair of antero-supraorbital spines and 3 pairs of postero-supraorbital spines, followed by a pair of occipital and a larger pair of nuchal spines; a small spine at upper hind edge of orbit, followed by 2 long spines and 1 at suprascapula; 2 preorbital spines, posterior one larger; suborbital stay with 3 spines; 3 preopercular spines, the uppermost longest and with a small prebasal spine; 2 divergent opercular spines; humeral spine very blunt and short. Small filaments at nostril, above eye, at both preorbital spines, and at upper opercular spine.

Color brownish, clouded with darker on back and sides, paler beneath; a dark brown blotch on spinous dorsal and an obscure brown band on the soft dorsal.

Length 98 mm.

After Fowler.

I refer here with hesitation 2 specimens, 55 and 58 mm in length, taken in the China Sea at 31 fathoms, off the west coast of Cavite Province.

SCORPAENA HEMILEPIDOTA Fowler

Scorpaena hemilepidota Fowler, U. S. Nat. Mus. Proc. **85** (1938) 63, *fig. 26*, Tubig Point, between Samar and Masbate, in 135 fathoms.

A Philippine species.

Dorsal XII–9; anal III–5; pectoral rays I–7–XI; 38 scales in lateral series just above the lateral line on figure, but 32 in text; 5 above and 14 below lateral line; 6 predorsal scales. Head, prepectoral area, pectoral base, and under side to behind ventrals naked. Gillrakers 6+13.

Fowler's figure has the depth 2.76, head 2.18, the angularly rounded caudal 3.95 in the length; eye 4.47 in the head, less than the snout, which is 3.8 in head. Fowler's description has the depth 2⅞, head 2⅛ in length; snout 3.8, eye 6 in head.

A pair of nuchal spines, a pair of antero-supraorbital and 2 pairs of postero-supraorbital spines, with pair of coronals posteriorly, followed by pair of occipital and nuchal spines; a cluster of 3 short supero-postocular spines, and finally a large suprascapular spine; tympanic spine above last postocular; 2 preorbital spines, posterior one larger and directed downward;

3 spines on suborbital stay; 5 preopercular spines, upper largest and with small prebasal spine; 2 divergent opercular spines, a strong humeral spine. Lateral line with numerous flaps or filaments; these also present on many head spines, those above eye, on preorbital and preopercular spines conspicuous.

Color light brownish, under surface paler to whitish; fins all pale brown.

Known only from the type, 202 mm long.

After Fowler.

SCORPAENA TAENIOPHRYS Fowler

Scorpaena taeniophrys Fowler, U. S. Nat. Mus. Bull. 100 14 part 2 (1943) 66, *fig. 12*, Cammahana Bay, Luzon.

Dorsal XII–11; anal III–5; pectoral XV, all rays simple. Scales 35 to 37 in transverse series just over the lateral line, 4 above to soft dorsal origin, 10 below to anal origin. Head, predorsal, prepectoral, and pectoral base all naked; preventral region with small scales.

Depth 2.5 (2.6 in figure), head 2.2, the rounded caudal 3.28 in length; the circular eye is 3.3 in the head, or 3.4 measured from the tip of the lower jaw; the broad depressed snout is shorter than the eye, a trifle more than 5 times in the head according to the figure, though the text says 4½. Gillrakers 5+10.

A pair of small nasal spines; a short low antero-supraorbital spine and 2 broad rather large postero-supraorbitals on each side, their edges finely serrated, all more or less directed backward; a pair of strong similar nuchal spines close behind the last named; the parietal and occipital spines form a strong keel with a rather deep median depression; a row of 3 broad short preorbital spines, the posterior one directed downward; suborbital stay with 6 small spines in figure, the text says "two very samll spines"; 5 spines along hind edge of preopercle; 2 very small postocular spines; 2 widely divergent opercular spines; humeral spine broad, obtuse. Long supraorbital flap little longer than eye; no other flaps on head or body.

Color in alcohol brown, variegated with darker on head and body; 3 rather conspicuous irregular blackish brown blotches along lateral line; 5 dark transverse bands on lower surface of head, inclusive of maxillary and mandible, all much narrower than interspaces; fins largely pale; spinous dorsal with median longitudinal dark band; anal with 2 broad dark transverse bands.

Two specimens, 25 and 27 mm in length, were taken with beach seine at Cammahana Bay, Luzon. These juvenile specimens may be only a stage of some other species. Their position must be uncertain until adult specimens are secured.

After Fowler.

Genus PARASCORPAENA Bleeker

Parascorpaena Bleeker, Verh. Akad. Amsterdam 16 (1876) 23, type *Scorpaena picta* (Kuhl and Van Hasselt) Cuvier and Valenciennes.

Dorsal XII–8 to 11; anal III–5 or 6; body oblong, compressed, scales ctenoid or cycloid, 36 to 60 in longitudinal series; head naked except behind eyes and on upper half of opercle, armed above with spiny crests, the preorbital bearing spines; the suborbital with erect spines; opercle with 2 spines, preopercle with 3 to 5 spines. Vertex more or less deeply grooved. Preventral region always scaled. Cutaneous filaments and appendages more or less present on head and body. Villiform teeth in jaws and on vomer and palatines. No scales on dorsals or anal. Dorsal, anal, and caudal rays divided; pectoral rays not elongate, the upper ones divided, or all the rays simple; no free pectoral rays. Branchiostegals 7.

Small or medium sized reef fishes of the Indo-Pacific.

Key to the Philippine species of Parascorpaena

A.—Scales cycloid, in about 45 transverse rows above the lateral line; posterior preorbital spine curved forward; the lower 11 or 12 pectoral rays entire, the others divided ..... *S. picta*

AA.—Scales ctenoid, about 36 transverse rows above lateral line; posterior preorbital spine directed downward; pectoral rays all simple *S. bandanensis*

PARASCORPAENA BANDANENSIS Bleeker

Scorpaena bandanensis Bleeker, Nat. Tijds. Ned. Ind. 2 (1851) 237, Banda Neira; Weber, *Siboga* Exped. (Fische) 57 (1913) 495, Sanguisiapo, Sulu Arch., Philippines, and 17 East Indian localities.

Parascorpaena bandanensis Bleeker, Verh. Akad. Amsterdam 16 (1876) 26, *plate 2, fig. 2,* 18 East Indian localities; Fowler, Bernice P. Bishop Mus. Memoirs 10 (1928) 285, after Bleeker.

Scorpaena aplodactylus Bleeker, Nat. Tijds. Ned. Ind. 3 (1859) 698, Ceram.

Scorpaena haplodactylus Günther, Cat. Fishes 2 (1860) 117, ? Fiji Islands; Steindachner, Sitzungsber. Akad. Wiss. Wien 56 (1867) 311, Cape York, Australia; Meyer, Soc. España Hist. Nat. Madrid Anal. 14 (1885) 20, Cebu, Cebu.

Scorpaena mcadamsi Fowler, U. S. Nat. Mus. Proc. 85 (1938) 60, *fig. 24,* vicinity of Jolo, Sulu Prov.; Linao Point, Gulf of Davao, Davao Prov., Mindanao.

East Indies and Philippines, east to the Marianas, Fiji, and Samoan Islands, and Cape York, Australia.

Known from Cebu, the Sulu Archipelago, and the Gulf of Davao in the Philippines, but undoubtedly much commoner than the few records would indicate.

Dorsal XI–1–9 or 10; fourth spine longest, 2.4 to 2.5 in head, longest ray 2 in head; anal III–5 or 6, second ray 1.8 to 1.9 in head; caudal convex, nearly twice in the head; pectoral with 15 to 16 rays, all simple, 1.3 to 1.5 in head, reaching to above third anal spine; ventral 1.75 to 1.85 in head; 36 transverse rows of scales immediately above lateral line, between the angle of the opercle and caudal base; 6 or 7 scales between lateral line and median dorsal spines; predorsal scales 5; head naked except behind eyes and on upper part of opercle.

The depth is 2.5 to 2.6, the head 2.3 times in the length; the eye is about 4, the snout 3.25, the maxillary 2.36 times in the head; the interorbital is less than the eye; gillrakers of short tubercles, 5 plus 8.

A supraorbital tentacle, usually fringed, equal to or longer than the eye; tentacles present on the snout and maxillary. Preorbital with 2 spines pointing forward, the third one directed downward and backward; 3 spines above the eye, 2 postocular spines, 2 on each side of the nape, a humeral and a post-temporal spine, one on the snout; 2 suborbital, 3 or 4 on the margin of the preopercle, and 2 spines on the opercle. The dorsal is deeply notched behind the eleventh spine.

Body greenish above in life, greenish rose to golden below, everywhere mottled with dusky; fins variegated dusky rose, the soft dorsal, anal, caudal, and pectoral with alternate dark and light cross-bars.

Largely uniform brown in alcohol, the fins little paler; soft dorsal, anal, caudal, and pectoral transversely barred.

This little fish, which reaches a length of 76 mm., is one of the commonest scorpaenids in the East Indies, according to Dr. Max Weber. He had 23 specimens from Sanguisiapo, an islet in the Sulu Archipelago, so it is evidently common in Sulu Province.

PARASCORPAENA PICTA (C. and V.)

Scorpaena picta Cuvier and Valenciennes (after Kuhl and Van Hasselt), Hist. Nat. Poiss. 4 (1829) 236 (321), Java; Cantor, Asiatic Soc. Jour. 18 (1850) 1022, Pinang; Günther, Cat. Fishes 2 (1860) 114, Celebes; Pinang; Bleeker, Versl. Akad., Amsterdam 12 (1861) 31, Singapore.

Parascorpaena picta Bleeker, Verh. Akad., Amsterdam 16 (1876) 25, *plate 2, fig. 4*, 24 East Indian localities; Fowler, Acad. Nat. Sci. Phila. Proc. 79 (1927) 287, Vigan, Ilocos Sur Prov., Luzon.

Scorpaena polyprion Bleeker, Verh. Bat. Gen. 22 (1849) 7, Scleroparei Sunda-Molukschen Archipel.; Günther, Cat. Fishes 2 (1860) 115, Amboina; Borneo; Ceylon.

East Indies and Philippines. The only Philippine record is from Ilocos Sur Province, Luzon.

Dorsal XII–10; the fourth and fifth spines longest, about 2.7 times in the head and twice in the depth; soft dorsal rounded, its longest rays equal to dorsal spines; anal III–5, its second spine longer than height of dorsal, twice an eye diameter; anal rays longer than dorsal rays, 1.85 in head; the convexly rounded caudal equals the second anal spine. Pectoral I–4or5–XI or XII, approximately equal to the head without the snout.

Scales cycloid, about 45 in a longitudinal series just above the lateral line, plus 2 on the caudal base; 7 or 8 above the lateral line and 16 below; predorsal scales 6; scales behind eye and on upper half of opercle. No orbital tentacle. Spines on top of head erect, the posterior preorbital spine curved forward, the two upper one pointing directly forward.

Depth 2.9, head 2.3 in length; eye about 4 to 4⅓ in head to end of opercular flap; interorbital space deeply concave, its width ⅔ to ¾ the diameter of the eye. Filaments and skinny flaps more or less present along the lateral line and sides of the body and on the head.

Color in preservation brown or greenish brown, marbled with darker; the soft dorsal, and anal with 2 or 3 oblique bars, the pectoral and caudal with several cross bars; axil of the pectoral with irregular yellow or pale spots.

This species reaches a length of 170 mm or more. It undoubtedly occurs throughout the central and southern Philippines, but has been overlooked by collectors.

Genus SEBASTAPISTES Gill

Body oblong, compressed, the broad head naked above with spiny ridges; head and body usually with skinny flaps; mouth large, with teeth on jaws, vomer, and palatines; 12 stout dorsal spines, rays 9 or 10; anal III–5 to 6, the second spine longest; pectoral large, rounded, the upper rays divided, the lower ones simple; ventrals inserted behind pectorals; no air bladder; scales mostly ctenoid; preorbital with 2 to 4 divergent spines,

the lower posterior one hooked and extending downward over maxillary.

Small stinging fishes of coral reefs throughout the tropical Indo-Pacific.

Key to Philippine species of Sebastapistes

A.—Head and body with large white, often circular, spots on body and opercular flap; longest dorsal spine 2 in head; scales 48 in longitudinal series, 7 above and 12 below lateral line ..... *S. nivifer*

AA.—Head and body more or less mixed or mottled brown or black and gray, but not with large white spots.

B.—Scales 35 to 40, five above and 10 or 11 below lateral line; longest dorsal spine 2.1 to 2.4 in head; pectoral axil not white spotted. *S. bynoensis*

BB.—44 or 45 scales in lateral series; 5 or 6 anterior scales of lateral line bearing spines; longest dorsal spine 2.5 to 2.66 in head; axil of pectoral with white spots or blotches ..... *S. nuchalis*

SEBASTAPISTES NIVIFER Jordan and Seale

Sebastapistes nivifer Jordan and Seale, U. S. Nat. Mus. Proc. 28 (1905) 791, *fig. 10*, Bais, Negros Oriental Prov., Philippines; Herre, Bur. Sci. Coll., 1924–28, Iloilo, Panay; Kolambugan, Lanao Province, Mindanao; Cebu, Cebu Province.

A Philippine species.

Dorsal XI–I–8; anal III–5; pectoral I–5–X; ventral I–5; gillrakers 5 plus 8 plus 2 very low tubercles; 24 tubulated scales in the lateral line, plus 1 on the caudal base; scales in longitudinal series just above lateral line, 48; scales above lateral line to middle of spinous dorsal, 7; from anus to lateral line, 12; predorsal 4.

The body is strongly compressed, the dorsal profile strongly arched, the breadth of the large wide head .8 of its own length. The depth is 2.7, the head 2.35, the slightly rounded caudal equal to the pectoral, both 3.24, the ventral 3.58 times in the length.

The large eye is high up, projecting above the profile, equal to the snout, 3.6 in the head; the narrow grooved interorbital has two smooth longitudinal ridges, its width twice in the eye. The fifth and sixth dorsal spines are longest, twice in the head, the longest dorsal ray 2.4 times; the second anal spine is much stronger than any of the dorsal spines, 1.7, the longest anal ray 1.8 in the head.

The head is armed with strong erect spines; a nasal, 3 supraorbital, a postocular, postfrontal, parietal, pterotic, nuchal, posttemporal, and humeral spines present; preorbital strongly armed with a sharp anterior spine projecting forward, a large sharp spine projecting laterally and downward, with a small accessory basal spine before it, and a posterior spine directed backward; suborbital stay broad; grooved, without spines; preopercle with 4 or 5 marginal spines, the uppermost largest and strongest, the next two much shorter, the fourth (and fifth when present) very short and more or less blunt; opercle with 2 large flats spines. A fringed orbital tentacle present, with skinny flaps and tentacles on the head.

The ground color in life is more or less yellow, with irregular transverse and more or less diagonal brown bands and spots on the back and sides, the fins largely clear. In alcohol the yellow turns to white or whitish, except before, between, and behind the eyes, where the yellow remains; posterior lobe of opercle with a more or less distinct white spot; back and posterior side before caudal peduncle with large white spots; fins all clear except the spinous dorsal which is vaguely clouded with darker.

Here described from a specimen 68 mm long, which I obtained on a coral reef at Dumaguete. In Jordan and Seale's figure, all pectoral rays are simple; this is probably an artist's error.

SEBASTAPISTES BYNOENSIS (Richardson)

Scorpaena bynoensis Richardson, Voy. *Erebus* and *Terror*, Ichthy. (1845) 22, *plate 14, figs. 3–5*, northwest coast of Australia; Günther, Cat. Fishes 2 (1860) 133, N. W. coast of Australia.

Sebastapistes bynoensis Whitley, Austral. Mus. Rec. 16 (1927) 29, Samoa; New Hebrides; Fowler, Fishes Oceania, Bernice P. Bishop Mus. Mem. 10 (1928) 289, Fiji; Borabora; Mademo; Raiatea; Agana, Guam; Apia, Samoa; Herre, Field Mus. Nat. Hist., Zool. ser. 21 (1936) 263, Nukulau island and reef near Suva, Viti Levu Island, Fiji; Maraa, Tahiti.

Scorpaena tristis Klunzinger, Verh. Zool.-Bot. Gesell. Wien 20 (1870) 802, Red Sea; Günther, Fische der Südsee 1 (1875) 77, *text figure*, Rarotonga; Peters, Monatsber. Akad. Wiss. Berlin (1877) 834, Fiji; Boulenger, Ann. Mag. Nat. Hist. London, 6th Ser. 20 (1897) 373, Rotuma.

Sebastapistes tristis Jordan and Seale, U. S. Bur. Fish. Bull. 25 (1906) 377, Philippines; Jordan and Seale, U. S. Bur. Fish. Bull. 26 (1907) 37, Panay, Philippines; Evermann and Seale, U. S. Bur. Fish. Bull. 26 (1907) 102, Bacon, Sorsogon, Prov., Luzon. Misprinted as *Sebastopistes;* Kendall and Goldsborough, Mus. Com. Zool. Mem. 26 (1911) 315, Borabora, Society Islands; Herre, Pan-Pac. Research Inst. Jour. 8 (1933) 9, Dumaguete, Negros Oriental Prov.,

Philippines; Herre, Fishes 1931 Phil. Exped. (1934) 65, Unisan, Tayabas Prov., Luzon; Alabat Island; Culion; Dumaguete; Herre, Fishes 1940–41 Exped., Dumaguete; Kolambugan, Lanao Prov., Mindanao.

Scorpaena bakeri Seale, Bernice P. Bishop Mus. Occ. Papers 1 (1900) 120, Guam.

Sebastapistes laotale Jordan and Seale, U. S. Bur. Fish. Bull. 25 (1906) 378, *fig. 7*, Apia and Pago Pago, Samoa.

Scorpaenopsis laotale Kendall and Goldsborough, Mus. Comp. Zool. Mem. 26 (1911) 314, Makema, Paumotus.

Occurs on coral reefs all over the tropical Indo-Pacific, and is of general occurrence in the Philippines.

Dorsal XII–10 or 9; anal III–5; pectoral II–3–XI or I–4–XI or I–5–X; the last is on my largest specimen. Ventral I–5; gillrakers low rounded tubercles with fimbriate tips 5 + 9; 35 to 40 scales in a lateral series just above the lateral line, plus 2 or 3 on the caudal base; 5 or 6 above and 10 or 11 below the lateral line; about 20 tubulated scales in the lateral line.

The depth is 2.7 to 2.85, the head 2.27 to 2.44, the caudal 3 to 3.8, the pectoral 3 to 3.66, the ventral 4 to 4.15 times in the length. The eye is 3.33 to 3.66 in the head and usually equal to the snout; the narrow deep interorbital is twice in the eye. A quadrangular groove or depression at the nape, and 2 small longitudinal ridges in the interorbital.

The body is laterally compressed, the back more or less elevated, the head moderately convex; head spinescent but not conspicuously so; a short but stout nasal spine, 3 supraocular, tympanic, sphenotic, postorbital, pterotic, postfrontal, posttemporal and nuchal spines present; a small humeral spine; preorbital with a sharp curved anterior spine projecting forward, and a lateral spine projecting downward; suborbital ridge with 2 small spines; preopercle with 3 or 4 spines along its hind margin, the uppermost one much the largest and strongest; opercle with 2 stout widely divergent spines.

The fourth, fifth, and sixth dorsal spines are longest, 5.17 to 5.5 in the length or 2.1 or 2.4 in the head, the longest dorsal ray 5 times in the length. The second anal spine is long and strong, twice in the head or 4.5 in the length, and equal to the longest anal ray.

A large broad fringed tentacle over the eye is typical of Klunzinger's *S. tristis*, and is entirely absent from *S. laotale*. *S. bynoensis* is described as having "orbital tentacles moderate." In a series of specimens taken at the same time and place in

the coral, I find some specimens with very large tentacles, some with small ones, and some with none at all. The size of the orbital tentacles has little relation to the size of the fish bearing them. I am therefore compelled to accept *S. bynoensis* as having precedence over *S. tristis*. Besides the orbital tentacle, the nasal, preorbital, preopercular, and other spines on the head may have tentacles or skinny flaps; several broad flaps along the lateral line.

The color in life is variable; some having the ground color pale gray or whitish, roseate beneath and on the caudal peduncle, dotted with black and with 3 or 4 irregular dusky transverse bands and usually a broad cross bar at the caudal base; others are purplish black, mottled with gray; the fins are pale, barred or mottled with reddish or brown or dusky; the lips and underside of the head are barred alternately with brown and whitish.

In preservative the general color pattern is little changed; roseate patches, especially large ones posteriorly, become whitish or very pale; most specimens are largely warm reddish brown, but may be gray mottled with brown; fins often handsomely spotted or barred with brown.

Here described from 15 specimens taken by me on the coral reefs at Dumaguete, their lengths 20 to 65 mm. The last is probably the maximum size of this little stinging fish. Specimens were also taken at Cebu, but only one is available, its length 51 mm.

SEBASTAPISTES NUCHALIS Günther

Scorpaena nuchalis Günther, Fische der Südsee 1 (1875) 76, *text figure*, Rarotonga; Günther Reports *Challenger* Exped. Zool. Shore Fishes 1 (1880) 59, Honolulu; Boulenger, Ann. Mag. Nat. Hist. London, 6th Ser. 20 (1897) 373, Rotuma.

Sebastapistes nuchalis Jordan and Richardson, U. S. Bur. Fish. Bull. 27 (1908) 279, Calayan Island, Babuyan Islands, north of Luzon, Philippines; Fowler, Bernice P. Bishop Mus. Mem. 10 (1928) 288, after Günther.

Known from Rarotonga, Rotuma, Honolulu, and the Philippines.

Dorsal XII–9 or 10; anal III–5 or 6; 45 scales in the lateral line; first 5 or 6 scales in lateral line spine-bearing; depth 2.75 and head 2.5 in the length. The eye equals or is less than the snout, 1.5 times in the head, or nearly twice as wide as the deeply concave interorbital; maxillary 1.9 in head, reaching to the hind margin of the eye; no pit below, and no tentacle above

the eye. Mouth little oblique, lower jaw not protruded. Palatine band of teeth shorter than the vomerine band. Head and body with skinny flaps. Fourth to seventh dorsal spines longest, 2.5 to 2.66 in head.

Spinous armature of head well developed; nasal, 3 supraocular, and 2 very small spines on hind margin of eye; strong tympanic, sphenotic, parietal, nuchal, posttemporal, postfrontal, and humeral spines present; preopercle with 4 or 5 marginal spines and 2 on the opercle; preorbital with an anterior forward-pointing spine, and 2 posterior ones directed downward and backward; suborbital ridge with 2 spines.

Color of head and body gray, marbled with brown, and with white dots below. A large black blotch on the head, not alike on both sides. A black blotch between the third to fifth dorsal spines, or more often between the seventh to the eleventh; pectoral axil with white spots. Reaches a length of 76 mm.

Description compiled, no specimens being available.

Genus MERINTHE Snyder

Merinthe Snyder, U. S. Fish Com. Bull. 22 (1904) 535, type *Sebastes macrocephalus* Sauvage; Jordan and Evermann, U. S. Fish Comm. Bull. 23 part 1 (1905) 461; Matsubara, Sigenk. Kenky. Trans. No. 2 (1943) 286.

A genus with very few species from the Hawaiian Islands to the Philippines, and North to Japan; and in the Caribbean Sea.

Body oblong, laterally compressed, the head large, long, with prominent bony ridges and spines; teeth on vomer and palatines; a long tentacle above the eye; interorbital space deeply concave, long and narrow; nasal, preocular, supraocular, postocular, tympanic, parietal, nuchal, preorbital, and suborbital spines present; no coronal spines; 4 preopercular and 2 opercular spines.

Scales ctenoid, extending on sides of head to below middle of eye; the jaws naked. Dorsal XII–9 to 11; anal III–5; pectoral 16 or 17, all rays simple; ventral I–5; gillrakers slender, an air bladder present.

Allied to *Helicolenus*. Species very few; one is widely distributed over the tropical Pacific and north to Japan. It probably occurs in the Philippines, but has not yet been taken there. This is *Merinthe macrocephala* (Sauvage).

Key to species of Merinthe

A.—Scales in lateral line 40 to 41; third and fourth dorsal spines 2.6 times in head ..... *M. nematophthalmus*

AA.—Scales 49 to 52; third and fourth dorsal spines 3.2 to 4.5 in head. Hawaiian Islands; Japan; Pelew Islands..... *M. macrocephala*

MERINTHE MACROCEPHALA (Sauvage)

Sebastes macrocephalus Sauvage, Soc. Philomat. Bull. Ser. 7 6 (1882) 169, Sandwich Islands.

Merinthe macrocephala Snyder, U. S. Fish Comm. Bull. 22 (1904) 535, Honolulu; Jordan and Evermann, U. S. Fish Comm. Bull. 23 part 1 (1905) 461, *plate 55*, Honolulu; Waikiki; Hilo; Fowler, Fishes Oceania, Bernice P. Bishop Mus. Mem. 10 (1928) 291, Honolulu; Hilo; Tanaka, Figs. and Descrip. Fishes Japan 45, p. 884, *plate 181, fig. 494;* Tokyo fish market; Matsubara, Sigenk. Kenky. Trans. No. 2 (1943) 287, *figs. 96–97*, Misaki, Japan; Pelew Islands.

This species is known from the Hawaiian Islands, the Pelew Islands, and Japan. It has not yet been reported from the Philippines but in all probability occurs there. It is therefore, included so that it may be recognized if collected.

Dorsal XII–9 to 11; anal III–5 or 6; pectoral rays all simple, 17; ventral I–5; gillrakers 2 plus 9 by Snyder's count, but Matsubara gives 7 to 9 plus 11 to 14; scales in longitudinal series 49 to 52, plus 5 on the caudal base; 9 above and 22 below the lateral line.

The depth of the elongate compressed body is 2.8 to 3, the very long head 2 times in the length; the eye is 5.5 to 6.5, the snout 2.7 to 3, the maxillary 2.1 to 2.2, the interorbital space 10 to 12.8 times in the head; the least depth of the caudal peduncle 4.35 to 6.5 in the head. Pectoral 1.5 to 1.66, the truncate caudal 1.87 to 2; third, fourth, and fifth dorsal spines 3.2 to 3.9, longest dorsal ray 2.46 to 3, the first anal ray 2.8, ventrals 2 in head. Ocular tentacle usually very long, 1.5 to 4.7 in head.

Nasal, preocular, supraocular, postocular, tympanic, parietal, and nuchal spines present; no coronal spines; 4 long spines across the cheek; preopercular margin with 3 spines, the upper one strongest and opposite the end of the suborbital stay; 2 broad opercular spines; 2 strong and very broad preorbital spines, directed downward and backward, the posterior one much the larger; cranial spines all very strong.

Color in life brick red to orange red, with 4 vague and irregular black cross bands above the lateral line; head and fins, except ventrals, usually irregularly mottled with small black spot; supraocular tentacle brick red, sometimes with black cross bars.

Pale brown in alcohol, or darker, and mottled with dusky brown above; fins, except ventrals, sprinkled with dusky.

Reaches a length of 478 mm, and a weight of 4 or 5 pounds.

MERINTHE NEMATOPHTHALMA (Günther)

Sebastes nematophthalmus Günther, Cat. Fishes 2 (1860) 99, West Indies; Ile de France ?; Günther, *Challenger* Reports, Zool. Shore Fishes k (1880) 52, Sulu Sea, near Zamboanga, Mindanao, at 82 fathoms; Challenger Station 201, 7° 3′ N. Lat., 121° 48′ W. Long.

Dorsal XI–I–10; anal III–5; scales in lateral line 40 to 41.

Greatest depth below fifth dorsal spine 3.5, the head 3 times in the length including the caudal. The eye is high up, projecting above the profile, 4 in the head, and shorter than the snout. Interorbital space concave, with 2 ridges, narrow, its width 11 times in the head. The maxillary reaches to a vertical from the center of the eye. Third and fourth dorsal spines longest, 2.6 in the head; the second anal spine is strong with a longitudinal groove, and is a trifle longer than the third dorsal spine. The pectoral fin reaches the anal, the ventral to the anus.

Spines of the head acute and prominent; nasal, preocular, supraocular, postocular, tympanic, parietal, and nuchal spines present; preorbital with 2 strong recurved spines on its lower margin; interorbital ridge with 3 spines; the suborbital ridge with 3 spines; preopercular margin rounded, with 4 spines, the uppermost strongest and opposite the extremity of the suborbital ridge; operculum with 2 flat spines; a pair of spines at the throat.

Color in life uniform red. Only the type, 14 inches long, and the specimen taken by the *Challenger* Exped. are known.

Genus SCORPAENOPSIS Heckel

Scorpaenopsis Heckel, Wiener Mus. Ann. 2 (1837) 158, type *Scorpaena nesogallica* Cuv. and Val.; Bleeker, Verh. Akad. Amsterdam 16 (1876) 28; Jordan and Fowler, U. S. Nat. Mus. Proc. 27 (1904) 136; Jordan and Evermann, U. S. Fish Comm. Bull. 23 part 1 (1905) 467; Barnard, South African Mus. Ann. 21 part 2 (1927) 904; Matsubara, Sigenk. Kenky. Trans. No. 2 (1943) 319.

Fishes of the tropical and warm temperate Indo-Pacific. The genus is well presented in Philippine waters, at least three of the five species thus far recorded from the Islands being of general occurrence from Luzon to the islands off the coast of Borneo.

This genus is distinguished at once from *Scorpaena* by its lack of palatine teeth. Most of the species are of a larger size and more uncouth appearance than the species of *Scorpaena*. They are violently stinging fish with large spiny misshapen heads.

Key to the Philippine species of Scorpaenopsis

A.—26 rows of scales in lateral series just above lateral line.... *S. cotticeps*
AA.—35 to 60 rows of scales in lateral series.
B.—Depression at occiput slight and little or not evident.
C.—50 to 60 rows of scales in lateral series; 9 to 11 rows above lateral line ..... *S. cirrhosa*
CC.—About 45 rows of scales in lateral series; 7 to 8 rows above lateral line ..... *S. novae-guineae*
BB.—Occipital depression deep and strongly marked.
D.—36 scales in lateral series; 8 lowermost pectoral rays simple ..... *S. stigma*
DD.—38 to 45 scales in lateral series; 11 to 14 lowermost pectoral rays simple ..... *S. gibbosus*

SCORPAENOPSIS COTTICEPS Fowler

Scorpaenopsis cotticeps Fowler, U. S. Nat. Mus. Proc. 85 (1938) 65, *fig. 27.*

Known only from a juvenile specimen 38 mm long from Tinakta Island, one of the Tawi Tawi group, Sulu Archipelago, Philippines.

Dorsal XII–10; anal III–5; pectoral 14, all rays simple; ventral I–5; scales along and close above lateral line 26, plus 3 on caudal base; pores in lateral line 20; 5 scales above and 11 below lateral line; predorsal scales 6. Gillrakers 4+10.

The depth is 2.4, the head 2, the convex caudal 2.9 times in the length. The snout is 3, the eye 3.875 in the head.

There is a pair of nuchal spines, a pair of small antero-supraorbital spines, 2 pairs of broad postero-spraorbital spines, a pair of small tympanics, a pair of broad parietals and of broad occipitals; 2 postoculars on each side, hind one larger; temporal spine moderate; suprascapular spine low; 2 widely diverging preorbital spines each side, front one directed forward, and posterior directed backward; suborbital stay with 4 low spines; 4 preopercular spines, upper longest and with basal auxiliary; 2 divergent opercular spines; humeral spine well developed. A deep bean-shaped pit or depression on occiput.

Opercle with a few small scales; scales on prepectoral and preventral areas much smaller than elsewhere.

Light brown, mottled with darker brown; text says fins all pale, but figure shows a large dusky spot between the fourth and eight dorsal spines and extending on back below; a dark band between soft dorsal and anal is reflected on the last of the dorsal spines and anterior rays; some transverse blotches on the anal; pectoral rays with small brown spots; white spots on lower sides of head and mandible.

Taken by the *Albatross* in 10 fathoms.

After Fowler.

SCORPAENOPSIS CIRRHOSA (Thunberg) **Tamalingking**

Perca cirrhosa Thunberg, Nya Handl. Act Holmae 14 (1793) 193, *plate 7, fig. 2,* Nagasaki.

Scorpaena cirrhosa Cuv. and Val., Hist. Nat. Poiss. 4 (1829) 233 (318), Japan; Malabar; Schlegel, Fauna Japonica Poiss. (1843) 42, *plate 17, figs. 2–3,* Nagasaki; Günther, Cat. Fishes 2 (1860) 120, China; Japan; Raoul Island; Amboina; Günther, Fische der Südsee 1 (1875) 78, *text fig., plate 54,* Tahiti and Society Islands.

Scorpaenichthys cirrhosus Bleeker, Nat. Tijds. Ned. Ind. 11 (1856) 402, Buru.

Scorpaenopsis cirrhosus Bleeker, Verh. Akad. Amsterdam 16 (1876) 32, Singapore; Ternate; Buru; Amboina; Bleeker, Atlas Ichth. 9 (1878) *plate 413, fig. 6;* Fowler, Bernice P. Bishop Mus. Mem. 10 (1928) 285, after Bleeker; Herre, Pan-Pac. Research Inst. Jour. 8 (1933) 9, Dumaguete, Negros Oriental Prov.; Herre, Fishes 1931 Phil. Exped. (1934) 65, Dumaguete.

Scorpaenopsis cirrhosa Day, Fishes India (1878) 150; Jordan and Starks, U. S. Nat. Mus. Proc. 27 (1904) 136, Wakanoura; Nagasaki; Jordan and Seale, U. S. Bur. Fish. Bull. 26 (1907) 38, Panay, Philippines; Herre and Myers, Lingnan Sci. Jour. 10 (1931) 252, Hong Kong; Fowler, Acad. Nat. Sci. Phil. Proc. 87 (1935) 398, South Africa; Matsubara, Sigenk. Kenky. Trans. No. 2 (1943) 320, *fig. 112,* Numazu, Kobe, Simonoseki, Nagasaki, Japan; Okinawa-honto.

Scorpaenopsis cirrosa Barnard, South African Mus. Ann. 21 (1927) 905, Natal Coast, South Africa.

Scorpaena oxycephalus Bleeker, Verh. Bat. Gen. 22 (1849) 7.

Scorpaenopsis oxycephalus Bleeker, Nat. Tijds. Ned. Ind. 17 (1858–59) 145, Bali; Bleeker, Nat. Tijds. Dierk. 2 (1865) 31, Manila Bay, Luzon, Philippines.

Scorpaenopsis oxycephala Sauvage, Mus. Hist. Nat. Paris Nouv. Arch. 8 (1873) 52, *plate 6, figs. 3–3a,* Mariveles, at the entrance to Manila Bay, Bataan Prov., Luzon; also seas of China.

A large violently stinging fish occurring from Japan to the Philippines, India, the Red Sea, South Africa, New Guinea, and the Society Islands. In the Philippines, it is found from Luzon to the extreme southern tip of the Islands.

Dorsal XII–10 or 9; anal III–5; pectoral divided rays 7 to 5, simple 11 or 12 or rarely 10. Gillrakers knoblike, 10 to 12 on lower part of first arch. Scales in longitudinal series just above lateral line 50 to 60; 9 to 11 rows above lateral line.

The body is oblong, compressed, large specimens becoming robust, the depth 2.6, caudal 3.7, pectoral 3.4, head 2.5 times in the length. Eyes prominent, the bony orbit elevated, 6.8 in the head, 2.53 times in the large broad snout, and 1.2 in the interorbital. In young specimens the interorbital is much less than the eye, but in large old adults it equals or even exceeds the eye. Snout 2.7 in the head. A groove below the eye, ending anteriorly in a wide deep pit. The mouth is wide, oblique, the maxillary ending opposite the middle or hind third of the eye. Occipital depression broad and shallow. A pair of nasal spines, 3 supraorbital spines with an additional spine behind, 2 occipital, 3 temporal, and 4 suborbital spines; 2 preopercular spines, the upper one with an accessory spine; 2 strongly divergent opercular spines; all spines strong and sharp; no coronal spines.

The large pectoral does not extend as far as the anal origin. The caudal is broadly rounded. Dorsal spines strong, the third longest, 2.35 in the head, the fin deeply notched between the spinous and rayed portions, the third to seventh rays a little longer, 2.24 in head; the second anal spine is very strong and longer than the third one, 2.6, the second anal ray 1.87 in the head; the ventrals extend beyond the anus but scarcely reach the anal origin. The head, body, and dorsal spines with many dermal flaps and filaments, especially large and numerous on the maxillary, lower jaw, margins of the preopercle and opercle, lateral line and sides of the body.

In life the color is clouded rose, from pale to deeper red with dusky mottling. Preserved specimens are irregularly blotched with dusky or blackish and gray to whitish, the lower parts paler with grayish brown markings; fins all transversely or obliquely marked by irregular dusky or blackish stripes alternating with gray or whitish one.

Here described from a large robust specimen 255 mm long, collected at Siluag Island, Sulu Province, and 2 specimens 99 and 100 mm in length, from Dumaguete. One of the Dumaguete specimens is a very dark phase, the cross bands and blotches mostly black, while the other one is unusually pale so that it looks as if it were a different species. Both of

these smaller specimens are unusually well supplied with dermal flaps and appendages, many of them fimbriated.

SCORPAENOPSIS NOVAE-GUINEAE (Cuv. and Val.)

Scorpaena Novae-Guineae Cuv. and Val., Hist. Nat. Poiss. 4 (1829) 235, New Guinea; Quoy and Gaimard, Voy. *Astrolabe,* Zoology 3 (1834) 687, *plate 11, fig. 1,* Port Doreh, New Guinea.

Scorpaenopsis Novae-Guineae Bleeker, Verh. Akad. Amsterdam 16 (1876) 34, *plate 4, fig. 3,* Sumatra; Celebes; Ceram; Amboina; Waigiu; Rawak; New Guinea.

Scorpaenopsis novae-guineae Sauvage, Mus. Hist. Nat. Paris Nouv. Archiv., 6th ser. 1 (1878) 129, on the type; Jordan and Seale, U. S. Bur. Fish. Bull. 25 (1906) 375, Samoa; Jordan and Seale, U. S. Nat. Mus. Proc. 28 (1907) 792, Bais, Negros Oriental Prov., Philippines; Jordan and Seale, U. S. Nat. Mus. Proc. 26 (1907) 38, Cavite, Cavite Prov., Luzon; Herre, Pan-Pac. Research Inst. Jour. 8 (1933) 9, Dumaguete, Negros Oriental Prov.; Herre, Fishes 1931 Phil. Exped. (1934) 65, Dumaguete; Herre, Fishes 1940–41 Exped., Kolambugan, Lanao Prov., Mindanao.

A scorpion fish from the East Indies, Philippines, New Guinea, and Polynesia.

Dorsal XII–9 or 10; anal III–5 or 6; pectoral I, 4 to 6 divided rays, then XI to XIII simple; gillrakers 4+10. Scales in longitudinal series just above lateral line 44 (usually 45); 7 above and 18 below the lateral line.

The oblong compressed body is highest at the dorsal origin, the depth 2.64, the large, rough, and very broad head 2.36, the slightly rounded caudal 4.1 times, the pectoral 3.7 times in the length. The bony spiny orbital socket is prominent, the eye 5.2, the snout 3.2 times in the head; snout with a prominent hump, 1.5 times the eye; interorbital about 1.3 times in the eye; no depression or a very slight one at the nape. A deep groove below the eye. The mouth is wide, oblique, the maxillary ending at a vertical from the posterior margin of the eyeball.

A pair of strong nasal spines, 3 supraorbital spines over each eye with an additional one behind; 3 pairs of temporal spines, 2 pairs of occipital spines, a pair of postocular spines, a pair each of pterotic, parietal, nuchal, and humeral spines, 4 spines on each suborbital stay, 2 pairs of strongly divergent preorbital spines; 5 spines on the free margin of each preopercle, the uppermost one largest and with a basal accessory spine, and 2 very divergent opercular spines. The pectoral and ventral fins reach to a perpendicular to the anus; the soft dorsal rays equal the longest dorsal spines; the anal rays exceed the anal spines and are much higher than the length

of the anal base; the second anal spine stout and longer than the others, 1.8 in the head.

Many skinny flaps and threads on the head and trunk, particularly on the free margin of the preopercle, the lower jaw, and the underside of the head; also smaller ones, more or less numerous, on the spinous and soft dorsal and pectoral.

The color in life is clouded rose, more or less marbled with dusky. In preservative, there are 2 or 3 broad diagonal blackish bands, with pale or whitish blotches and spots between, nearly white on the belly, the muzzle and cheeks darkest; a basal dusky band on the caudal, followed by a pale band and 2 wide irregular blackish stripes; spinous dorsal with a blackish median band between the second and fifth spines, the rest of the fin with clear membrane and mottled spines; the soft dorsal and anal with diagonally transverse clear and blackish irregular bands; pectoral with 2 broad blackish transverse stripes; ventrals mottled dusky on the outer half.

Here described from a specimen 111 mm long, from Caxisigan Island, near Balabac, Palawan Province.

SCORPAENOPSIS STIGMA Fowler

Scorpaenopsis stigma Fowler, U. S. Nat. Mus. Proc. 85 (1938) 66, *fig. 28*, off Point Tagolo Light, Zamboanga Province, Mindanao, in 200 fathoms.

A Philippine fish.

Dorsal XII–9; anal III–5; pectoral I–6–VIII; ventral I–5. Scales along and close above lateral line 36 in figure, plus 3 on caudal base (26+2 in text); 4 above and 9 below lateral line; 5 predorsal scales from dorsal to occiput, or 13 to middle of eye; gillrakers 6+14.

The depth is 2.875, the head, 2.25, the rounded caudal 4.52 times in the length. The eye is greater than snout, 3 times in the head, and much greater than the deeply concave interorbital which is 9 in the head; snout 4 in head.

A pair of strong nasal spines behind the front pair of nostrils; low antero-supraorbital spine, and two greatly higher strong postero-supraorbital spines on each side, followed by coronal pair, then large parietal pair and finally occipital pair; strong postocular spine over top of preopercle, followed by another over top of opercle and one at suprascapula; 2 broadly obtuse preorbital spines; suborbital stay with 5 strong spines, followed by strong spine at preopercle angle, last with outer prebasal spine; lower preopercle edge with 3 spines, upper

directed backward, the 2 lower directed downward; 2 wide-set opercular spines; strong oblique humeral spine. Scales on prepectoral and preventral areas smaller than elsewhere, those on caudal base, and belly next in size. Cirri above the eye and behind several other spines.

Body brown, head and fins paler to whitish; a black blotch as big as the eye on upper part of spinous dorsal between the fifth to tenth spines.

The type 69 mm long and paratype of 68 mm are the only specimens known.

After Fowler.

SCORPAENOPSIS GIBBOSA (Bl. and Schn.)

Scorpaena gibbosa Bloch and Schneider, Syst. Ichth. (1801) 192, *plate 44;* Bleeker, Soc. Sci. Indo-Nerrl, Act 1 (1856) 31, Amboina; Günther, Cat. Fishes 2 (1860) 119, after Bleeker.

Scorpaena gibbosa Jordan and Evermann, U. S. Fish Comm. Bull. 23 part 1 (1905) 468, *plate 46, fig. 206,* Honolulu, Oahu, and Hilo, Hawaii; Jordan and Hubbs, Carnegie Mus. Mem. 10 (1925) 272, Kagoshima Bay, Japan; Barnard, S. African Mus. Ann. 21 part 2 (1907) 906, Natal Coast; Herre, Fishes 1933–34 and 1936–37 Expeds., Puerto Galera, Mindoro; Dumaguete, Negros Oriental Province; Matsubara, Sigenk. Kenky. Trans. No. 2 (1943) 322, *figs. 113–115,* Tateyama and Kagoshima, Japan; Hatizyozima and Itoman, Okinawa-honto, Riu Kiu Islands.

Scorpaenopsis gibbosus Bleeker, Soc. Sci. Indo-Neerl. Act. 8 (1860) 24, Sumatra; Bleeker, Verh. Akad. Amsterdam 16 (1876) 38, *plate 2 fig. 1,* Sumatra; Nias; Celebes; Timor; Batjan; Ceram; Amboina; Banda Neira; Aru Islands; Bleeker, Atlas Ichth. 9 (1878) *plate 411, fig. 5,* as *Scorpaena diabolus,* and *plate 416, fig. 4;* Fowler, Bernice P. Bishop Mus. Mem. 10 (1928) 286, Gilbert, Marshall, Tuamotu, Society, and Marquesas Islands; Honolulu; Guam.

Scorpaena nesogallica Cuv. and Val., Hist. Nat. Poiss. 4 (1829), Mauritius; Guerin, Iconogr. Règne Animal, Poiss. (1929–44) *plate 13, fig. 2;* Günther, Cat. Fishes 2 (1860) 119, Mauritius.

Scorpaenopsis nesogallica Heckel, Wien. Mus. Ann. 2 (1840) 159.

Scorpaena diabolus Kner (not of C. and V.) Reise Novara, Fische (1865) 117, *plate 6, fig. 1.*

Scorpaenopsis diabolus Bleeker, Verh. Akad. Amsterdam 16 (1876) 36, *plate 1, fig. 3,* seven, East Indian localities; Bleeker, Atlas Ichth. 9 (1878) *plate 411, fig. 5.*

Scorpaenopsis catocala Jordan and Evermann, U. S. Fish Comm. Bull. 22 (1903) 201, Honolulu; Hilo; Jordan and Evermann, U. S. Fish Comm. Bull. 23 part 1 (1905) *plate 56,* Honolulu; Hilo.

Widely distributed in the tropical Indo-Pacific, from Honolulu and the Marquesas to Mauritius and Natal, and of general occurrence in the Philippines.

Dorsal XII–8 to 10, usually 9; anal III–5 or 6; pectoral I–4 or 5 divided rays, plus 10 to 12 simple rays; gillrakers 3 to 6 or 7, plus 7 to 10; scales in longitudinal series 38 to 45, with 8 scales between lateral line and dorsal origin, or 7 to middle of spinous dorsal.

The oblong compressed body with dorsal profile markedly elevated, depth 2.25 to 2.4, head 2 to 2.37, pectoral 2.85 to 3.6, caudal 3.64 to 4.3 times in the length. The head is large, rough, with spiny bony ridges and a deep quadrangular occipital pit. The eye is 6 to 6.8 in the head (5 in young specimens), the bony spinate orbital ring prominent, the concave interorbital broad, 1.3 to 1.7 times the eye; a groove under the eye ends anteriorly in a deep pit. The rough, strongly humped snout is 3.3 to 3.5 (exceptionally 2.8) times in the head, and 1.5 to 2 times the eye. The oblique mouth is large, the maxillary extending past the eye, its expanded posterior end much broader than the eye; a prominent symphyseal knob at the tip of the lower jaw.

Two or three spines at each nostril, 3 or 4 spines above each eye; 2 small postocular spines; a pair of coronal spines; suborbital stay broad, prominent, with 5 to 8 spines; preorbital with 5 to 8 divergent spines; 5 preopercular spines, the uppermost largest, and with an erect basal accessory spine; 2 large divergent opercular spines, each termination in 2 to 4 points; humeral spine very strong; 2 to 4 pairs of nuchal, and 2 pairs of parietal spines.

The spinous dorsal is low, the longest spines more than 3.5 in the head, the soft dorsal rays a little longer; the second anal spine is long and strong, 2.5 in the head; the anal is much higher, the longest rays twice in the head. The pectoral extends beyond the anal origin when depressed; the ventral scarcely reaches the anus. The trunk is covered with many skinny flaps and filaments, especially posteriorly; these extend upon the soft dorsal and pectoral, and may occur sparingly on the anal, caudal, and spinous dorsal; they may be few or many on the head, with a large broad flap on the posterior, lowermost preorbital spine, and nearly always many on the jaws and underside of the head.

The color is greenish or dusky rose or purplish red, becoming gray or pale in preservative, with 2 or 3 broad blackish diagonal bands, the first from the anterior 4 or 5 dorsal spines downward and forward over the opercle and pectoral base to the underside of the head and isthmus; the second from the ante-

rior half of the soft dorsal to the anal base; the third across the caudal base; upper part of the spinous dorsal between the third to sixth spines black, and a large black spot on the back below the bases of the sixth to eighth dorsal spines; body with a blackish spot on each scale, these spots forming diagonal lines running upward and backward; pectoral and caudal each with a wide black band on the outer part, besides the basal bands already mentioned, their tips and between the bands rosy, gray, or pale; soft dorsal and anal each with a transverse blackish band; anal with a black membrane between the second and third spines; tip of ventrals pale or rosy, the rest black. Axil of the pectoral rosy or yellow, usually with circular black spots.

Here described from specimen 126 mm long from Siluag Island, Sulu Province, checked with a specimen of 45 mm from Cuyo, one of 103 mm from Cebu, and three from Dumaguete, Negros Oriental Province, 78 mm, 86 mm and 142 mm in length. The largest of the specimens from Dumaguete agrees beautifully with Bleeker's fine plate of *Scorpaenopsis diabolus*.

Genus SCORPAENOPSELLA Fowler

Scorpaenopsella Fowler, U. S. Nat. Mus. Proc. 85 (1938) 67, type *Scorpaenopsella armata* Fowler.

One species from the Philippines is all that is known.

Body elongately ellipsoid, greatest depth midway in standard length, well compressed. Head large, nearly half of length, well compressed. Snout rather obtusely conic; eye large, impinging on upper profile, the narrow interorbital deeply concave. Mouth large, the lower jaw protruded, with blunt or rounded symphyseal knob; maxillary reaches below eye, expanded behind; teeth small, pointed, in 4 or 5 irregular rows above; fewer rows below, outer row enlarged, it alone extending posteriorly in jaws; teeth on vomer, none on palatines. Gill opening very large, membrane forming narrow fold across isthmus. Head with a few scales behind eye, and on opercle; scales on body rather small. Lateral line complete, conspicuous. No scales on chest, prepectoral, or front of belly. Spinous dorsal lower than soft dorsal; fins not deeply notched. Anal small, second spine longest, first less than half second. Pectoral rather short, with broad deep base; caudal moderate; text says ventral inserted before pectoral origin, but figure indicates it is behind. Armature of the head strong.

After Fowler.

SCORPAENOPSELLA ARMATA Fowler

Scorpaenopsella armata Fowler, U. S. Nat. Mus. Proc. **85** (1938) 68, *fig. 29*, Sombrero Island, Balayan Bay, and Verde Island Passage, Batangas Prov., Luzon, in 118 fathoms; length of type 88 mm.

A Philippine species.

Dorsal XII–9; anal III–5; pectoral II–7–XI; ventral I–5; gillrakers 6+12. Scales in longitudinal series 37, counting just above lateral line, 6 above lateral line and 14 below; 3 postocular scales and 9 predorsal to occipital spines.

The depth is 2.75, the head 2.125 times in the length; the snout is 3.875 in the head, the eye 4.5 the orbit or bony socket equal to the snout; the eye is 1.25 in the snout, and greatly exceeds the interorbital which is 7 times in the head; the maxillary reaches to the middle of the eye or beyond, 2 in the head; occipital quadrate depression rather deep.

There is a pair of short strong nasal spine; antero-supraorbital spines low, and 3 pairs of postero-supraorbital spines, followed by occipital and nuchal pair; 2 small suprapostocular spines, followed by 2 large ones, and finally suprascapular spine. Small tympanic spine over and close to second (fourth of entire series) large postocular; blunt anterior preorbital spine directed downward; suborbital stay with 3 spines; 5 preopercular spines, upper largest, with a small basal spine; 2 wide-set opercular spines opposite, lower nearly reaching gill opening; strong humeral spine inclined back and upward.

Third dorsal spine 3.1 in head, third ray 2.6; second anal spine 3.25 in head, first ray 2.5 caudal convex, 1.66, least depth of caudal peduncle 5, pectoral 1.9, ventral 2 in head.

Head largely naked except patch of few postocular scales and small area on upper part of opercles; chest, breast, prepectoral region, pectoral bases, and front of abdomen naked. On each side of the snout tip is a flap as long as the pupil, and a large fringed flap on each nostril; a small filament from first postero-supraorbital spine and a large flap from the second preorbital spine.

Light brown, paler to whitish below. An obscure darker brown cross bar before dorsal, and 5 others from dorsal base on back, first at fifth dorsal spine, second at seventh, third at eleventh, fourth at third dorsal ray, fifth at seventh. Dark bar from eye on cheek; spinous dorsal with black or dark basal blotches from first to seventh spines and ninth to eleventh spines, also some terminally; obscure blotches on soft dorsal

and anal; caudal with 3 or 4 indistinct darker transverse bars; pectoral with 4 to 6 dark transverse bars.

After Fowler.

Genus NEMAPONTINUS Fowler

Nemapontinus Fowler, U. S. Nat. Mus. Proc. 85 (1938) 73, type *Nemapontinus tentacularis* Fowler.

A Philippine genus with one species known.

The body and large head laterally compressed; eye in anterior half of head, with a tentacle above it twice an eye diameter in length. Teeth in villiform bands in jaws and on vomer; none on palatines. Head with well-developed spines. Gill opening large, membranes free. Scales small, ctenoid, in oblique series on body. Lateral line complete. Dorsals united, anterior spines highest, the soft dorsal rounded; anal with 3 spines, the second one largest. Caudal convexly rounded. Pectoral pointed, its rays all simple; ventral inserted a little before the pectoral origin.

Related to *Pontinus* Poey, but differs in the very long supraorbital tentacles.

After Fowler.

NEMAPONTINUS TENTACULARIS Fowler

Nemapontinus tentacularis Fowler, U. S. Nat. Mus. Proc. 85 (1938) 73, *fig. 32.*

A Philippine species.

Dorsal XII–9; anal III–5; pectoral 16; ventral I–5; scales 42 to 45 above and long lateral line; tubular scales in lateral line 23 to 29+1 or 2; 8 scales above, 12 or 14 below; 14 to 17 preocular scales; gillrakers 6+13; 4 above and 6 below are rudimentary tubercles.

Depth 2.75 to 3, head 1.9 to 2.1 times in the length; snout 3.3 to 3.4, eye 4.2 to 4.75 in the head; eye nearly twice the deeply concave interorbital. Maxillary reaches to middle of eye or beyond, its length 2⅛ to 2⅙ in head.

A pair of small, strong, nasal spines; a pair of antero-supraorbital spines and 3 pairs of postero-supraorbital spines, followed by a pair of well-developed occipital and nuchal spines; a strong postorbital spine, followed by another more posterior and close to smaller one on suprascapula; 2 preorbital spines, posterior larger and directed backward; suborbital stay with 4 spines, of which first on preorbital; 4 preopercular spines, upper largest and with small prebasal spine; 2 wide-set oper-

cular spines, larger above, opposite one another; a strong humeral spine.

Scales very small on breast, chest, prepectoral region, and caudal base. Scales on cheek and postocular smaller than on opercle and top of head, which is otherwise naked. A long supraorbital filament, 2. 2 in head, but less developed or absent in small specimens; small filament at anterosupraorbital spine and one at each preorbital spine.

Caudal twice in head; soft dorsal rays higher than dorsal spines, 2.5 to 2.75 in head; pectoral with pointed tip, extending to above first anal spine, 1.6 to 1⅞ in head.

Brown, clouded obscurely with paler and darker; 5 dark saddles along back, but little reflected on bases of fins; supraorbital tentacle blackish; fins all pale or light brown.

The type, 185 mm long, was taken in 182 fathoms off Point Tagolo Light, Zamboanga Province, Mindanao. Two paratypes, 158 and 168 mm in length, were taken in 117 fathoms from the China Sea, near Malvatuan Island, one of the Lubang Islands, northwest of Mindoro. All the specimens were dredged by the *Albatross*.

Genus HIPPOSCORPAENA Fowler

Hipposcorpaena Fowler, U. S. Nat. Mus. Proc. 85 (1938) 71, type *Hipposcorpaena filamentosa* Fowler.

Only known from the Philippines.

Body deepest at hind part of head, sloping rapidly down from dorsal origin to caudal peduncle; head very large, compressed, deep, inclined forward; snout very long, compressed, with concave profile and hump at tip. Eye small, elevated, orbital socket rising above upper profile. Mouth small, low; mandible shallow, little protruding; teeth obsolete; maxillary greatly expanded behind. Interorbital deeply concave. Two opercular spines. Scales small, adherent, smooth. Lateral line complete, with skinny flaps. Fin rays all simple except in caudal. Dorsals separated by a deep notch. Pectoral large, inserted well behind ventral; caudal shorter than head, lower rays longest.

Only one species known. (After Fowler).

Recognized by its deep body, peculiar physiognomy, advanced ventrals, and well separated dorsals.

HIPPOSCORPAENA FILAMENTOSA Fowler

Hipposcorpaena filamentosa Fowler, U. S. Nat. Mus. Proc. 85 (1938) 72, *fig.* 31.

Dorsal XI–10 in text, but figure shows XI–1–9; anal 9 (? II–7); pectoral 14; ventral 1–5; gillrakers 6 plus 11, low spinescent tubercles. The depth is 2.25, the head 2.1, the caudal 2.75 times in the length. The snout is 1.9, the eye 6.25 times in the head. The maxillary does not quite reach opposite the front margin of the eye, its length 2.8 in the head. Four divergent spines on the margin of the preopercle, the 2 upper largest; 2 large divergent spines on the opercle. A dark tentacle above the eye, its length more than the eye.

Second dorsal spine longest, twice in the head, the longest dorsal ray 2.75. Pectoral 1.6, ventral 1.8 in head, its insertion in advance of the pectoral origin.

About 30 scales above lateral line from head to caudal base, 6 above and 15 below the lateral line. Eight rather long cutaneous flaps above and close to lateral line. No distinct scales on head.

Brown generally; fins mostly paler than body, except black ventrals and lower part of caudal.

Only known from the type, 38 mm long, taken at Linao Point, Gulf of Davao, Davao Province, Mindanao.

After Fowler.

Genus PTEROIS (Cuvier) Oken

Pterois (Cuvier) Oken, Isis (1817) 1183, type *Scorpaena volitans* Bloch; Günther, Cat. Fishes 2 (1860) 122, in part; Jordan and Starks, U. S. Nat. Mus. Proc. 27 (1904) 141; Jordan and Evermann, U. S. Fish Comm. Bull. 23, part 1 (1905) 463; Barnard, South African Mus. Ann. 21 (1927) 911, in part.

Pseudomonopterus Bleeker, Verh. Akad. Amsterdam 16 (1876) 40, in part.

Macrochyrus Swainson, Nat. Hist. 2 (1839) 264, type *Scorpaena miles* Bennett.

Pteroleptus Swainson, ibid; type *Pteroleptus longicauda* Swainson.

Pteropterus Swainson, Nat. Hist. 2 (1839) 265, type *Pterois radiata* Cuv. and Val.

Zebra fishes; Lion fishes; Lolong. Beautiful but very dangerous coral reef fishes of the tropical Indo-Pacific.

Four of the six species are positively known from the Philippines. It is highly probable that *Pterois cincta* also occurs in Philippine waters.

Dorsal XI–XII–10 to 13; anal III–6 to 8.

The head and body are laterally compressed, the ctenoid or cycloid scales in 40 to 95 transverse rows, counted just above the lateral line from the angle of the opercle to the caudal base. Opercles and preopercles scaled. The head is

armed with spines above and on the sides, and is more or less garnished with tentacles and skinny flaps, often fimbriate. Eyes large, more or less elevated, the bony rim spiny or serrate; suborbital stay and preopercle serrate. Villiform teeth in jaws and on vomer. Operculum with a single flat spine.

Dorsal spines, all or most of them elongate and largely free, with basal portion united by a membrane; dorsal, anal, and caudal rays all divided; pectoral rays all simple, the upper rays largely free, or else the membrane is very deeply and obliquely notched; caudal convex, none of its rays produced. Seven branchiostegals. Air bladder large.

The members of this genus are subject to a great deal of variation in color and in the length of dorsal spines and pectoral rays. These are in part due to age, but sex may play a part. The development of the orbital tentacle and of other cirri is likewise variable.

Key to the Philippine species of Pterois

A.—Dorsal spines 12; scales ctenoid; 55 transverse rows above the lateral line ..... *P. antennata*

AA.—Dorsal spines 13; scales cycloid.

B.—Soft dorsal and anal without spots; nape scaly.

C.—65 to 70 transverse rows of scales above lateral line; 6 to 7 scales between lateral line and median dorsal spines; caudal red without spots; soft dorsal and anal more or less spotted. *P. lunulata*

CC.—About 80 transverse rows of scales above lateral line; 10 to 12 scales between lateral line and medial dorsal spines; soft dorsal, anal, and caudal roseate or colorless, unspotted ..... *P. russelli*

BB.—Soft dorsal, anal, and caudal spotted; nape naked; 90 to 95 transverse rows of scales above lateral line; 12 between lateral line and median dorsal spines ..... *P. volitans*

PTEROIS ANTENNATA (Bloch)

Scorpaena antennata Bloch, Aüsland Fische 3 (1787) 21, *plate 185*. *Pterois antennata* Cuv. and Val., Hist. Nat. Poiss. 4 (1829) 265 (361), Waigiu; Lesson, Voy. *Coquille*, Zool. Poiss. 2 (1830) 212, Offack Bay, Waigiu; Bleeker, Nat. Tijds. Ned. Ind. 5 (1853) 72, Solor; Günther, Cat. Fishes 2 (1860) 124, Cochinchina; China; Amboina; Pearl Islands; M. Weber, Fische, *Siboga* Exped. (1913) 497, Sanguisiapo, Sulu Archipelago; Fowler, Acad. Nat. Sci. Phil. Proc. 79 (1927) 288, Calapan, Mindoro; Fowler, Bernice P. Bishop Mus. Mem. 10 (1928) 292, Guam, Ebon Island, Marshall Islands; Makatea, Tuamotu Islands; Herre, Pan-Pac. Research Inst. Jour. 8 (1933) 9, Dumaguete, Negros Oriental Prov., Philippines; Herre, Fishes 1931 Phil. Exped. (1934) 64, Dumaguete; Herre, Field Mus. Nat. Hist. Zool. Ser. 21 (1936) 264, Tenibuli, Ysabel Island, Solomon Islands; Herre, 1948 Collection; a specimen

97 mm. long, at Layia, Batangas Prov., Luzon. Dumaguete, Negros Oriental Prov., specimen 94 mm. long.

Pseudomonopterus antennatus Bleeker, Ned. Tijds. Dierk. 1 (1863) 234, Ternate.

Pseudomonopterus (*Pterois*) *antennatus* Bleeker, Versl. Akad. Amsterdam 16 (1864) 368, Aru Islands; Bleeker, Verh. Akad. Amsterdam 16 (1876) 48, Sumatra, Java, Celebes, Solor, Ternate, Buru, Ceram, Amboina, Goram, Banda Neira, Aru, Waigiu; Bleeker, Atlas Ichth. 9 (1878), *plate 413, fig. 5.*

Tropical Indo-Pacific from Mauritius to the Philippines, China; Guam, and southeast to the Tuamotu and Marquesas Islands. Generally distributed through the central and southern Philippines, but only recorded from Luzon, Mindoro, Negros Oriental, and the Sulu Archipelago.

Dorsal XI–I–11 to 12; anal III–6 or 7. Scales ctenoid, 55 transverse rows above lateral line; 7 to 8 scales between lateral line and median dorsal spines; the nape is scaly.

Depth 2.6 to 3, the head nearly 3 to 3 times in the length.

The interorbital space is very concave, its width about three-fourths the diameter of the eye, which is almost equal to the snout and 3 to 3.5 times in the head. A fimbriate tentacle above the eye, and longer than an eye diameter. Preopercle with 2 or 3 marginal spines. The dorsal spines are higher than the body, the 7th, 8th, and 9th longest, only united by membrane basally; soft dorsal obtusely rounded and much lower; anal rays rounded, as long as the dorsal rays. The pectoral reaches to or upon the caudal, or even beyond its tip, the rays for the greater part free of membrane, and thread-like. Caudal rounded, shorter than the head. Reaches a length of 163 mm.

Rose red in life, with about 13 darker red (brown in preservative) cross bands; orbital tentacle ringed with black; dorsal and anal rays and caudal spotted with rows of brown or dusky spots; pectoral with 2 brown or blackish transverse stripes on its base.

PTEROIS LUNULATA Schlegel

Pterois lunulata Schlegel, Fauna Japonica Poiss. (1842) 46, *plate 15,* Nagasaki; Richardson, Ichth. China, Japan (1846) 213, Canton, China; Günther, Cat. Fishes 2 (1860) 124, Japan; Steidnachner, Sitzungsber. Akad. Wiss. Wien 60 (1870) 661, Singapore; Jordan and Starks, U. S. Nat. Mus. Proc. 27 (1904) 142, Tokyo, Misaki, Wakanoura, and Yokohama, Japan.

Pseudomonopterus (*Pterois*) *lunulatus* Bleeker, Verh. Akad. Amsterdam 16 (1876) 47, Singapore; Japan.

A Japanese species ranging southward to the Philippines and Singapore.

In 1940 I obtained a specimen at Brooke's Point, Palawan. In July 1948, an excellent specimen was collected by me at Dumaguete, Negros Oriental Province. No doubt of general occurrence throughout the Islands, but over-looked by collectors.

Dorsal XII–I–10 to 12; anal III–7 or 8; pectoral 12 or 13. Scales cycloid, small, 65 to 70 in transverse series close above lateral line; 6 or 7 scales between middle dorsal spines and lateral line; nape scaly; depth about 3, head 3 to 3.5 times in the length. The interorbital is very concave, its breadth less than the diameter of the eye, which is 3.5 to 4 times in the head, or 1.5 to 2 in the snout; preopercle margin with 3 to several spines. Eye with or without a medium-sized tentacle above it.

Height of the dorsal spines less than the body, the middle spines longest, united basally by a membrane. In the young the pectoral reaches the caudal base, becoming longer with age; the membrane between the upper rays very deeply incised; the rounded caudal is equal to or longer than the head. Reaches a length of 270 mm.

The color is red, the spinous dorsal, pectoral and ventral darker; head with 3 darker cross stripes, the first below the eye, the second behind the eye to the preopercle, the third from the nape to the opercle; body with 12 or 13 dark or black cross bars; dorsal and anal rays faintly spotted with black; caudal spotted in the young, but becoming clear red; ventral with blackish spots; pectoral with 6 or more irregular transverse rows of rounded, elongate, or semilunar black or dusky spots.

PTEROIS RUSSELLI Bennett

Kodipungi Russell, Fishes Coromandel 2 (1803) 25, *plate 133*, Vizagapatam, India.

Pterois russellii Bennett, Zool. Soc. London Proc. 1 (1831) 128, Mauritius.

Pterois russellii Day, Fishes India (1878) 152, *plate 36, fig. 5;* Madras.

Pterois russelli Herre, Fishes 1940–41 Exped.; Iloilo, Iloilo Prov., Panay; Herre, Manila Bay, Luzon, May 25, 1948; specimen 147 mm long.

Pterois kodipungi Bleeker, Nat. Tijds. Ned. Ind. 3 (1852) 450, Banka; Günther, Cat. Fishes 2 (1860) 124, Australia; Bleeker, Ned. Tijds. Dierk. 2 (1865) 31, Manila Bay, Luzon; Barnard, South African Mus. Ann. 21 (1927) 913, Natal Coast.

Pseudomonopterus (*Pterois*) *kodipungi* Bleeker, Verh. Akad. Amsterdam 16 (1976) 45, Sumatra; Batu; Nias; Singapore; Banka; Java; Celebes.

India, East Indies, Philippines, and southeast to Queensland, Australia. In the Indian Ocean it extends to the islands of Mauritius and to Natal, South Africa. Philippine records are from Manila Bay, and from Iloilo, Panay.

Dorsal XII–I–11 to 13; anal III–7 to 8; p. 13. Scales cycloid, small, in 75 to 80 transverse rows close above lateral line; 8 to 10 scales between median dorsal spines and lateral line; nape scaly. Depth nearly 3 or less, head about 3 in the length.

Eye strongly elevated, 3 to 4 times in the head; interorbital strongly concave, equal to or ¾ of an eye diameter; eye without a tentacle or with a moderate one. Margin of preopercle with 3 to several spines. Dorsal spines much higher than the body, united basally by a membrane; dorsal rays obtusely rounded, little higher than the body. Pectoral in the young reaches the tip of the caudal or beyond; with advancing age, it extends to the caudal base or nearly so, the membrane of its upper rays deeply incised. Caudal bluntly rounded, not longer than the head. Attains a length of 300 mm.

Color red, with 14 or 15 transverse brown stripes on the head and body; soft dorsal, anal, and caudal colorless or roseate; ventral membrane violet, the rays with yellow spots; pectoral more or less variegated with blackish spots, the axil with some yellow spots.

PTEROIS VOLITANS (Linn.)

Gasterosteus volitans Linn., Syst. Nat., ed. 10 (1758) 296, Amboina.
Scorpaena volitans Bloch, Ausländ Fische 3 (1830) 18, *plate 184;* Bennett, Fishes Ceylon (1830) *plate 1*, Ceylon.

Pterois volitans Cuv. and Val., Hist. Nat. Poiss. 4 (1829) 258, *fig. 88;* Rüppell, Neue Wirbelt., Fische (1835) 107, Red Sea; Günther, Cat. Fishes 2 (1860) 122, Egypt; South Africa; Cape of Good Hope; Madras; China; Amboina; Sydney, Australia; Günther, Fische der Südsee 1 (1875) 81, Society Islands; Pelew Islands; Day, Fishes India (1878) 153, *plate 37, figs. 1–2*, Madras; Jordan and Seale, U. S. Bur. Fish. Bull. 25 (1906) 379, *plate 51*, Apia, Samoa; Evermann and Seale, U. S. Bur. Fish. Bull. 26 (1907) 103, Bacon, Sorsogon Prov., Luzon; Fowler, Copeia No. 58 (1918) 65, Philippines; Herre, Bur. Science Collection, 1921–28, Calapan and Puerto Galera, Mindoro; Bantayan Island, Cebu Prov.; Zamboanga, Zamboanga Prov., Mindanao; Herre, Fishery Resources Philippine Islands (1927) 64, *plate 38, fig. 2;* Fowler, Bernice P. Bishop Mus. Mem. 10 (1928) 292, Jaluit and Ebon

Islands, Marshall Islands; Apia, Samoa; Nukahiva, Marquesas Islands; Kusaie, Caroline Islands; Guam; Herre, Pan-Pac. Research Inst. Jour. 8 (1933) 9, Dumaguete, Negros Oriental Prov.; Herre, Fishes 1931 Phil. Exped. (1934) 65, Culion; Dumaguete; Jolo and Sitankai, Sulu Prov.; Herre, 1948 Collection; Nasugbu, Batangas Prov., Luzon.

Pseudomonopterus volitans Bleeker, Ned. Tijds. Dierk. 1 (1863) 234, Ternate.

Pseudomonopterus (*Pterois*) *volitans* Bleeker, Verh. Akad Amsterdam 16 (1876) 42, Sumatra; Batu; Nias; Bintang; Bangka; Java; Bawean; Celebes; Sangi; Sumbawa; Timor; Letti; Ternate; Buru; Ceram; Amboina; Nusa Laut; Banda Neira.

Tandang; Lolong; Zebra Fish; Lion Fish; Butterfly Scorpion Fish. A conspicuous reef-fish, well known since the time of the earliest explorers.

This species, largest of the zebra fishes, has an enormous range. Discovered at Amboina by Europeans, it occurs from the east coast of Africa and the Cape of Good Hope through the East Indies and Philippines to the Riukiu and Bonin Islands, Pelews, tropical Australia, the Marshall, Society, and Marquesas Islands.

In the Philippines it is common on coral reefs from Luzon and Mindoro to the extreme southern tip of the Sulu Archipelago. It may be expected on reefs anywhere in the Philippines.

Dorsal XII–I–11 to 12; and III (rarely II)–6 to 8; pectoral 14 to 16. Scales cycloid, quite small, 90 to 95 transverse rows, close above lateral line; 12 between the median dorsal spines and the lateral line; the nape is naked. Depth 2.8 to 3 times, the head about 3 in the length.

The prominent eyes strongly elevated, 3 to 4 times in the head; interorbital very concave, its width equal or nearly equal to the eye; preopercular margin with 2 to 4 spines; tentacle above eye commonly well developed and longer than the eye.

Dorsal spines higher than the body, united basally by membrane; rayed dorsal obtusely rounded, little lower than body; on young specimens the pectoral extends upon the caudal or beyond its tip; adults have it reaching the caudal base or upon the caudal; the bluntly rounded caudal is about equal to the head; anal rays not lower than dorsal rays. Bleeker records a length of 310 mm.

Dusky red, the head and body with numerous dark red or black narrow transverse bands and stripes, bordered by white

lines; soft dorsal, anal, and caudal with rows of dark brown or black spots; spots on the pectoral and ventral larger.

Zebra Fishes

Genus DENDROCHIRUS Swainson

Dendrochirus Swainson, Nat. Hist. 2 (1839) 180, type *Pterois zebra* Cuv. and Val.; Jordan and Evermann, U. S. Fish Comm. Bull. 23, part 1 (1905) 465.

Brachyrus Swainson, Nat. Hist. 2 (1839) 264, logotype *Pterois zebra* Cuv. and Val.

Brachyrus Matsubara, Sigenk. Kenky. Trans. No. 2 (1943) 354.

Beautiful tropical Indo-Pacific fishes, graceful and attractive looking, but able to inflict severe and dangerous wounds. They occur from the east coast of Africa and Madagascar to China, the Hawaiian, Gilbert, Fiji, and Samoan Islands. We have two wide-ranging species of the very few known.

In most respects *Dendrochirus* is like *Pterois*. The pectoral does not reach the caudal fin; the membrane between the rays is not divided, or only so at the tip so that none of the rays are free; some of the rays are branched, only the lower 7 or 8 being simple.

Key to the Philippine species of Dendrochirus

A.—40 to 45 transverse rows of scales; central dorsal spines much less than body height ..... *D. brachypterus*

B.—48 to 54 transverse rows of scales; central dorsal spines much longer than body height ..... *D. zebra*

DENDROCHIRUS BRACHYPTERUS (Cuv. and Val.)

Pterois brachypterus Cuvier and Valenciennes, Hist. Nat. Poiss. 4 (1829) 70, no type locality; Bleeker, Nat. Tijds. Ned. Ind. 3 (1852) 265, Amboina and Ceram; Günther, Cat. Fishes 2 (1860) 126, Amboina; Klunzinger, Fische Rot. Meer., Verh. Ges. Wien 20 (1870) 808, Red Sea; Günther, Fische der Südsee 1 (1874) 82, Samoa; M. Weber, Fische, *Siboga* Exped. (1913) 497; Pearl Bank, Sulu Archipelago, Philippines.

Pterois brachyptera Barnard, South African Mus. Ann. 21 (1927) 914, Natal Coast, South Africa.

Pseudomonopterus brachypterus Bleeker, Ned. Tijds. Dierk. 2 (1865) 148, Buru.

Pseudomonopterus (*Dendrochirus*) *brachypterus* Bleeker, Verh. Akad, Amsterdam 16 (1876) 53, *plate 3, fig. 3*, Celebes; Solor; Ceram; Amboina; Bleeker, Altas Ichthy. 9 (1878) *plate 415, fig. 3*.

Dendrochirus brachypterus Jordan and Seale, U. S. Bur. Fish. Bull. 25 (1906) 378; Fowler, Bernice P. Bishop Mus. Mem. 10 (1928) 295, synonymy in part; Hawaiian Islands; Herre, Pan-Pac.

Research Inst. Jour. 8 (1933) 9, Dumaguete, Negros Oriental Province; Herre, Fishes 1931 Phil. Exped. (1934) 66, Dumaguete; Sitankai, Sulu Province; Herre, Phil. Collection 1948, Puerto Galera, Mindoro.

East coast of Africa to the East Indies, Philippines, Australia, Hawaiian, and Samoan Islands.

Not rare on coral reefs in the central and southern Philippines, but only recorded from Mindoro, Negros Oriental Province, and Sulu Province; said to be common at Culion.

Dorsal XIII–9 to 11, very rarely with XII spines; anal III–6; pectoral I–8–VIII or I–9–VII. Scales ctenoid, 40 to 45 transverse series close to lateral line, 6 scales between lateral line and dorsal spines. Opercles, preopercles and predorsal area scaly; interorbital naked.

Depth 2.4 to 2.5, the head 2.6 to 2.7 in the length; eye prominent, equal to or slightly exceeding the snout, 3.5 in the head. Supraorbital, occipital, preorbital, and preopercular ridges all with numerous small spines; free margin of preopercle with 3 prominent spines; opercle with a single flat spine. Fleshy tentacles above eye, on the posterior spine of the preorbital and on the preopercular margin; small tentacles on the nostrils. The second to ninth dorsal spines much longer than the others, but much less than the depth, in which the tallest spine goes 1.7 times. Attains a length of 166 mm.

Color rosy, the head with 2 dark crossbands, one beneath the eye, the other over the nape and opercle; the trunk with 6 broad dark crossbands more or less encircling it; pectoral barred with black and white; soft dorsal, anal, and caudal with rows of black spots; in life the membrane is colorless, so that the spots on the caudal, anal, and soft dorsal seem as if they were floating freely in the water.

DENDROCHIRUS ZEBRA (Cuv. and Val.)

Pterois zebra Cuvier and Valenciennes, Hist. Nat. Poiss. 4 (1829) 270, Mauritius; Quoy and Gaimard, Voy. Uranie, Zool. (1825) 329, Coupang Bay, Timor; Cuvier, Règne Animal Poiss. (1829) *plate 24, fig. 1,* Quoy and Gaimard, Voy. *Astrolabe* Zool. 3 (1834) 692, *plate 11, fig. 6,* New Guinea; Bleeker, Jour. Ind. Arch. 3 (1849) 66–68, Celebes; Bleeker, Nat. Tijds. Ned. Ind. 3 (1852) 265, Amboina and Ceram; Günther, Cat. Fishes 2 (1860) 126, Amboina; China; Madagascar; Günther, Fische der Südsee 1 (1875) 82, Pelew Islands; Garman, Mus. Comp. Zoology Bull. 39 (1903) 239, Suva, Fiji; Barnard, South African Mus. Ann. 21 (1927) 915, Natal Coast.

Pseudomonopterus zebra Bleeker, Ned. Tijds. Dierk. 1 (1863) 234, Ternate.

Pseudomonopterus (*Dendrochirus*) *zebra* Bleeker, Verh. Akad. Amsterman 16 (1876) 50, Sumatra; Batu; Nias; Bali; Celebes; Timor; Ternate; Buru; Ceram; Amboina; Banda Neira; Aru; Waigiu; Rawak; Bleeker, Atlas Ichthy. 9 (1878) 411, *fig. 1.*

Dendrochirus zebra Jordan and Seale, Bur. Fish. Bull. 25 (1906) 378; Evermann and Seale, U. S. Bur. Fish. Bull. 26 (1907) 103, Bacon, Sorsogon Prov., Luzon; Fowler, Bernice P. Bishop Mus. Mem. 10 (1928) 294, Guam; Gilbert Islands; Fiji; Herre, Pan-Pac. Research Inst. Jour. 8 (1933) 9, Dumaguete, Negros Oriental Prov.; Herre, Fishes 1931 Philip. Exped. (1934) 66, Dumaguete. Herre, Fishes 1936–37 Exped., Sitankai, Sulu Prov.; Herre, Indian Mus. Mem. 13 (1941) 272, Madagascar; Andamans, Philippines; Pelews; Guam; Fiji; Herre, 1948 Collection, Cebu, Cebu Province; Dumaguete, Negros Oriental Prov., 30 mm long.

Zebra Fish; Lolong. Tropical Indo-Pacific from Natal and Mauritius to the East Indies, Philippines, China, Guam, Fiji, and Gilbert Islands.

Recorded in the Philippines from Luzon, Cebu, Negros Oriental Province, and Sulu Province. Reported also from Calapan, Mindoro; Culion; Puerto Princesa, Palawan; and Davao Gulf, Mindanao.

Dorsal XIII–10 or 11; anal III–6 or 7; pectoral I–7–VIII or II–8–VII. Scales ctenoid, about 50 (48–55) transverse rows close above lateral line; 8 scales between lateral line and median dorsal spines; interorbital naked; opercles, preopercles, and nape scaly.

Depth equal to head, 2⅔ to 2.75, the rounded caudal 3.4 to 3.5 in the length. The large prominent eye is 3.75 in the head, a little shorter than the snout; interorbital very concave, its width half or two-thirds an eye diameter. The elongate dorsal spines are almost free of membrane, the fourth to tenth inclusive all higher than the body depth, the eight spine longest and a fifth more than the greatest depth. Supraorbital ridge with several small spines, the postorbital ridge serrate; a pair of nasal spines; 3 strong occipital and 4 temporal spines; preorbital with stellate ridge continued across cheek to preopercular spine, below which are 2 more; a strong suprascapular spine; opercle with a flat spine. A long fleshy orbital tentacle, usually 1.5 times the eye; nasal tentacles long and thread-like; anterior preorbital tentacle long and thread-like, the broad posterior one extending to or beyond the posterior end of the maxillary; two large broad fringed tentacular flaps on the lower margin of the preopercle.

Color more or less red or rose red in life, with reddish black cross bands, 2 or 3 on the head and 6 or 7 on the trunk. In

alcohol the color is reddish to brown, with broad dark brown or blackish brown cross bands; often 2 or 3 blackish bars upon the eye and radiating downward from it; soft dorsal, anal, and caudal with 5 or 6 or more rows of blackish brown spots, which in life seem to be free in the water, as the intervening membrane is colorless; pectoral with several rows of semilunar or angulate spots between the rays; a white spot (yellow in life) in its axis.

This beautiful, bizarre, and dangerous fish reaches a length of 170 mm.

Genus BRACHYPTEROIS Fowler

Brachypterois Fowler, U. S. Nat. Mus. Proc. 85 (1938) 79, type *Brachypterois serrulifer* Fowler.

A Philippine and Indian genus, related to the Japanese genus *Ebosia*. Only one species is known.

Dorsal spines shorter than soft dorsal rays; caudal long, pointed; pectoral extends beyond anal insertion; ventral falling much short of anal. Preorbital depth half of eye. Ridges of head serrulate, including the mandible. Eye "greatly longer than snout," but figure shows it only a trifle longer. No flaps or cirri.

After Fowler.

BRACHYPTEROIS SERRULIFER Fowler

Brachypterois serrulifer Fowler, U. S. Nat. Mus. Proc. 85 (1938) 79, *fig. 35*, off San Fernando Point Light, La Union Prov., Luzon; in 45 fathoms; length 115 mm.

Gulf of Lingayen, off San Fernando Light, La Union Province; Manila Bay; and Ragay Gulf, all of Luzon. It is also common at the mouth of the Hugli river, India, and elsewhere in the northern part of the Bay of Bengal.

Dorsal XIII–9; anal III–5; pectoral II–6–VI. My numerous specimens have 46 to 48 transverse rows of scales from the opercular angle to the caudal base; Fowler's text gives 40, but his figure shows 48.5 scales between lateral and dorsal spines; 15 predorsal scales to opposite front edge of pupil. Preventral and prepectoral scales, as well as those on pectoral and caudal bases much smaller than elsewhere.

Dorsal membrane covering spines, only their tips free. Depth 2.75, head 2.4 in length; eye 3.6 in head, snout about 3.9 in figure. Gillrakers 5+11. Dorsal spines low, second to fifth longest, about 2.33 in head; longest ray of soft dorsal about 1.7 in head. Pectoral longer than head, extending beyond anal base.

No nasal spines; supraorbital ridge finely serrated; parietal occipital ridge continuous, edge finely serrated; postocular ridge serrated; suborbital stay serrated its whole length; preorbital with 5 downward directed spines; preopercular edge with 5 prominent denticles; lower inner edge of mandibular ramus finely serrated.

Color brown, with 6 darker brown cross bands on the upper part of the body, the bands sometimes disappearing; a large blackish spot on the spinous dorsal; the pectoral is black, the ventrals largely blackish; the soft dorsal and anal with rows of dark spots, the anal blackish distally; the caudal with 5 or 6 transverse rows of spots.

In 1940 I obtained 3 specimens from Manila Bay and 2 from Ragay Gulf, Luzon, ranging in length from 42 to 77 mm. I also examined 15 specimens from the mouth of the Hugli, India, one from the Arakan coast, and one from the Bay of Bengal off Gopalpur, India, their lengths 65 to 80 mm. In 1948 I collected 11 specimens from Manila Bay, their lengths 58 to 82 mm.

Genus PARAPTEROIS Bleeker

Parapterois Bleeker, Nat. Verh. Akad. Amsterdam 16 (1876) 54, type *Pterois heterurus* Bleeker.

Parabrachirus Matsubara, Sigenk. Kenky. Trans. No. 2 (1943) 346, type *Pterois heterura* Bleeker.

This genus is known from the Moluccas, India, Formosa, and Japan, and is therefore, bound to be discovered in Philippine waters.

Caudal fin truncated in adults, with the upper and lower rays prolonged and thread-like; 13 slender dorsal spines, their membrane deeply incised so that the spines are almost entirely free; dorsal, caudal, and anal rays branched; pectoral very long, reaching to the caudal peduncle, its membrane extending to the tips of the rays, the 8 or 9 lower rays simple.

Only one species is known.

PARAPTEROIS HETERURUS Bleeker

Pterois heterurus Bleeker, Act. Soc. Sci. Ind. Neerl. Beschr. vischf. Amboina 1 (1856) 33, Amboina; Günther, Cat. Fish 2 (1860) 127; Fowler and Bean, U. S. Nat. Mus. Proc. 62 (1922) 62, Takao, Formosa.

Parapterois heterurus Bleeker, Verh. Akad. Amsterdam 16 (1876) 55, *plate 1, fig. 4*, Amboina; Atlas Ichthy. 9 (1878) *plate 415, fig. 6*.

Pterois macrura Alcock, Asiat. Soc. Bengal Jour. 65 (1896) 303, Bay of Bengal; Alcock and McGilchrist, Illustr. Zool. *Investigator*, Fishes Part 2 (1892) *plate 18, fig. 4*.

Pterois jordani Regan, Ann. Mag. Nat. Ser. 7 15 (1905) 20, Inland Sea, Japan.

Dendrochirus jordani Synder, U. S. Nat. Mus. Proc. 42 (1912) 428, Simizu, Japan.

Brachirus jordani Jordan and Hubs, Carnegie Mus. Mem. 10 (1925) 273, Kagoshima Bay; Kamohara, On the Off-shore Bottom Fishes of Prov. Tosa, Shikoku, Japan (1938) 48.

Parabrachirus heterurus Matsubara, Sigenk. Kenky. Trans. No. 2 (1943) 348, *figs. 121–122*, Kumano-nada, Maisaka, and Shimonoseki, Japan.

Dorsal XIII–9; anal II or III–7 or 8; pectoral 10 or 11–VIII or IX; scales in longitudinal series 36; gillrakers on lower limb of first arch 16 to 20, usually 17 or 18.

The body is oblong, compressed, the depth 2.8 to 3.5, the head 2.4 to 2.88 in the length. The eye is elevated above the dorsal profile, 2.75 to 3.7, the snout 2.9 to 3.9, the maxillary 2.18 to 2.46, the interorbital width 5.25 to 7.38 times in the head. Body covered with ctenoid scales; opercle, preopercle, interorbital space, and side of snout with scales. The slender dorsal spines are free except for a basal connecting membrane. The pectoral extends to or nearly to the caudal base; only the tips of its simple rays are free, the fin otherwise entirely covered by membrane. The uppermost and lowermost, or next to lowermost caudal rays are elongated and threadlike, longer than the head, the rays proportionately longer in larger specimens, the 9 intervening rays truncate.

The ridges above and behind the eye are strongly serrate with numerous teeth; a strong erect nasal spine; the preorbital and the suborbital ridge with numerous small spines, those pointing downward on the preorbital longer than the others; preopercle with 3 strong sharp spines at the end of the suborbital ridge, and 4 small ones on its lower margin; opercle with a small flat spine.

Roseate to reddish brown in life, paler below; sides of head with 5 or 6 dusky transverse stripes, margined with darker; body with 5 or 6 wide blackish transverse bands; pectoral dusky violet with 8 or more wavy cross stripes of blue; soft dorsal, anal, and caudal with numerous rows of dark brown or blackish spots.

Bleeker had but one specimen, 131 mm long; Fowler's specimens ranged from 73 to 148 mm in length. Matsubara's specimens measured from 36.6 to 152.5 mm. Other Japanese specimens described under various names not cited here but considered identical by Matsubara, range up to 269 mm.

Genus NEMAPTEROIS Fowler

Nemapterois Fowler, U. S. Nat. Mus. Proc. 85 (1938) 81, type *Nemapterois biocellatus* Fowler.

A Philippine genus, with only one species known. Known by its extraordinary long preorbital barbel; dorsal spines moderate, much less than body depth. Pectoral moderately long, entire. Each dorsal spine with greater terminal part free, expanded before and behind, and main part of spine forming distinct midrib.

After Fowler.

NEMAPTEROIS BIOCELLATUS Fowler

Nemapterois biocellatus Fowler, U. S. Nat. Mus. Proc. 85 (1938) 81, *fig. 36.* Only the type, 83 mm long, is known; it was taken off Jolo, Sulu Prov., at 22 fathoms.

Dorsal XIV–8; anal III–5; pectoral III–7–IX. Gillrakers 4+11. Scales 41 in text, but figure shows 50 transverse rows from angle of opercle to caudal base; 6 scales above lateral line to dorsal spines; 15 predorsal. Scales small and crowded on pectoral base and prepectoral and preventral areas.

Depth about 2.6, head about 2.5, caudal 3.6 in length in figure. Eye prominent, 3 in head, more than twice width of interorbital, and greater than snout. Preorbital barbel three-fourths as long as head and reaching to pectoral base. Eight and ninth dorsal spines longest, 1.58 times in the depth, much longer than the dorsal rays, but equalled by the longest anal rays; the ventral does not reach the anal. A broad flap above eye; several flaps along the preopercular margin.

No nasal spines; a low antero-suborbital spine on each side; a pair of higher postero-supraorbital spines on each side, followed by a pair of wide-set coronal spines, then strong close-set parietal and occipital pairs; the low postocular keel ends in a small point over the preopercle, followed by another over opercle and finally a suprascapular spine; ridge of suborbital stay without distinct spines; no preorbital spines; 3 short obtuse spines on preopercle edge; opercle with one rather large spine; no humeral spine.

Color: dull flesh color to pink. Brown blotch on maxillary followed by broad white band from front of eye downward. Two brown bars extending downward from eye across cheek and opercle. White lines in eye radiate from iris. Five brown cross bands on head and trunk. Spinous dorsal with 3 longitudinal dark brown bands, the 2 upper appearing as spots on the free parts of the white spines; 2 large black ocelli with

white margins on the outer part of the soft dorsal; anal blackish brown with a median white band; caudal white with a dark basal cross band and 5 transverse rows of dark brown spots on the rays; ventral black, with 2 white spots and edged with white. Preorbital tentacle white with 4 black bars.

Genus PTEROIDICHTHYS Bleeker

Pteroidichthys Bleeker, Soc. Sci. Ind. Neerl. Act. 1 (1856) 34, type *Pteroidichthys amboinensis* Bleeker; Günther, Cat. Fishes 2 (1860) 127; Bleeker, Verh. Akad. Amsterdam 16 (1876) 5–56.

An East Indian genus.

Head and body compressed, the head scaleless and without spines except on the opercle and preopercle. About 40 ctenoid scales in a longitudinal series, teeth on jaws and vomer, none on palatines. All fins except ventrals with simple rays. Dorsal origin over the posterior part of the opercle, with 11 slender spines, their membrane entire, the rayed portion separated by a deep notch. Anal II–7; ventral I–5; pectoral entire, without free rays. Branchiostegals 7.

PTEROIDICHTHYS AMBOINENSIS Bleeker

Pteroidichthys amboinensis Bleeker, Soc. Sci. Ind. Neerl. Act. 1 (1856) 34, Amboina; Günther, Cat. Fishes 16 (1860) 127; Bleeker, Verh. Akad. Amsterdam 16 (1876) 57, *plate 1, fig. 5,* Manado, Celebes, Amboina; Bleeker, Atlas Ichthy. 9 (1878) *plate 414, fig. 1.*

Only known from 2 specimens, 74 and 82 mm in length, from the localities cited above. Included here because practically all marine fishes taken at Manado likewise occur in the southern and central Philippines.

Dorsal XI–11; anal II–7; pectoral 15; caudal 13; ventral I–5; scales 40, in longitudinal series; about 22 in transverse series, with 5 or 6 between the lateral line and middle dorsal spines. Lateral line complete, well developed, the tubules simple.

The dorsal profile irregular, with elevated orbits, and a hump at the dorsal origin; depth 3, head 2.4 or 2.5, caudal 2.8, pectoral 2.9 times in the length. The eye is 4.0 or 4.1, the long snout 2.6, the maxillary 2.1 times in the head. The interorbital is deeply concave; a quadrilateral depression at the nape; elevated crenate crests at the nape and post-temporal region; no spines on the preorbital or the suborbital stay; preopercle with 4 blunt spines; opercle with 2 subequal divergent spines.

A branched tentacle longer than the head above the eye; nasal and rostral tentacles both longer than the eye; numerous cirri beneath the lower jaw. A deep notch separates the spinous and soft dorsals; the first dorsal spine 3 times, the fourth and fifth spines twice in the head; the soft dorsal and anal rays high, the longest about 1.4 in the head; the pectoral reaches the middle of the anal; ventral 1.5 times in the head, scarcely reaching the anal when depressed.

The color in life was roseate above, paler to whitish beneath, with 4 or 5 broad dusky bands across the back, the head more or less yellowish below, the snout and the tentacles dusky; the pectoral purplish rose, lightly dotted or transversely striped basally with blue; 3 darker cross-bands on the caudal; the other fins yellowish, mottled with purplish.

After Bleeker.

Genus PHENACOSCORPIUS Fowler

Phenacoscorpius Fowler, U. S. Nat. Mus. Proc. 85 (1938) 69, type *Phenacoscorpius megalops* Fowler.

A Philippine and East Indian genus.

Body compressed, elongately ovoid, back but little elevated. Head large, compressed. Snout short, obtuse, less than eye. Eye large, nearly in front half of head, meets upper profile. Mouth large, closed jaws nearly even. Maxillary reaches below eye, expanded behind. Teeth in villiform bands in jaws, on vomer, none on palatines. Interorbital narrow, concave. Gill opening wide, membranes scarcely united, free from isthmus. Gillrakers lanceolate. Pseudobranchiae well developed. Spines of head strongly developed, large, conspicuous, with high keels and sharp points. Few slender filaments on head. Scales large, weakly ctenoid, cover most of head, but fins, except caudal base, naked. Lateral line very short, only slightly developed on several anterior scales. Dorsals moderately notched, spines moderate and soft fin shorter than spinous. Anal like soft dorsal, spines slender, second largest. Caudal rounded. Pectoral moderate, reaches anal. Ventral small, inserted slightly before pectoral.

Characterized chiefly by its imperfect lateral line, large scales, heavy armature of the head, and large eyes.

After Fowler.

PHENACOSCORPIUS MEGALOPS Fowler

Phenacoscorpius megalops Fowler, U. S. Nat. Mus. Proc. 85 (1938) 70, *fig. 30.*

A Philippine and East Indian species.

Dorsal XII–9; anal III–5; pectoral I–8–VIII; ventral rays I–5; scales in longitudinal series 30+3 according to Fowler's description, but his figure shows about 51; scales from soft dorsal to anal origin, 15; predorsal to middle of eyes, 17. Lateral line incomplete, only on first 4 or 5 scales. Scales on prepectoral, preventral, and precaudal areas much smaller than elsewhere. Gillrakers 7+14, lanceolate, 4 or 5 above and below only rudiments.

Depth 2.8 to 3, head 2.2 to 2.33 in length; snout 4 to 4.2, eye 3.5 to 3.6 in head; interorbital less than eye; maxillary reaches vertical from middle of eye, 2 in head. Fourth dorsal spine 2.87 to 3 in head, fourth ray 2.16 to 2.33; second anal spine 2.6 to 2.66, third ray 2.125 to 2.2; caudal convexly rounded, 1.8 to 1.875; pectoral 1.33 to 1.4; ventral 1.875 to 2 in head.

Spines all well developed, strong; pair of nasals; pair of antero-supraorbitals; 3 pairs of postero-supraorbitals followed by 2 strong occipital and nuchal pairs; 3 postoculars, first small and close behind eye; strong suprascapular spine; 2 very broad obtuse preorbitals; suborbital stay with 6 or 7 spines, of which last may be double; 4 preopercular spines, with one at outer front edge of uppermost, which longest; 2 widely divergent opercular spines, opposite, and lower sometimes extends over gill opening; strong oblique humeral spine.

Pale brownish generally. Iris grayish above. Fins all pale to whitish. Spinous dorsal with dark brown to blackish blotch on sixth or seventh or even eighth membranes. In the young the black dorsal spot contrasts strongly and extends over all membranes involved.

Type 109 mm long, taken in 209 fathoms off Bagatao Island Light, between Burias and Luzon. Also a series of paratypes, from depths of 37 to 340 fathoms.

After Fowler.

Genus MACROSCORPIUS Fowler

Macroscorpius Fowler, U. S. Nat. Mus. Proc. 85 (1938) 75, type *Macroscorpius pallidus* Fowler; Matsubara, Sigenk. Kenky. Trans. No. 2 (1943) 385.

A Philippine and Japanese genus with a single species known.

Body elongate, slender, moderately compressed, deepest at spinous dorsal origin; head large, conic, elongate; snout long, conic; eye about equal, with broad dental area of upper jaw

exposed; mandible scarcely protruding, with broad bony spur at symphysis; teeth fine, roughly granular, sharp points prickly to touch; narrow band on vomer and each palatine. Interorbital low, nearly level. Gill opening wide, but slightly joined to isthmus; gillrakers lanceolate, moderate. Bones of head all more or less cavernous, with sharp though small and inconspicuous spines. Scales caducous, cycloid; head largely naked; bases of caudal and pectoral scaly. Lateral line complete, conspicuous canal with large pores, few in number, axial along upper side of body. Dorsals separated, membranes of spinous fin entire to ends of spines; (figure shows membrane strongly incised, Herre); soft fin nearly or quite as high as first dorsal; anal similar, smaller and opposite, with 2 slender spines, second larger and longer; caudal moderate; pectoral long, reaches to or on anal, especially in young; ventral inserted slightly before pectoral origin.

Apparently differs from *Lioscorpius* Günther in having but 2 anal spines. *Setarches remiger* (Gilbert and Cramer) differs in its 3 anal spines, deeper body, more dorsal spines, joined dorsal fins, longer pectoral, and very small scales.

After Fowler.

MACROSCORPIUS PALLIDUS Fowler

Macroscorpius pallidus Fowler, U. S. Nat. Mus. Proc. 85 (1938) 76, *fig. 33;* Matsubara, Sigenk. Kenky. Trans. No. 2 (1943) 386, *fig. 136.*

Dorsal XI–10; anal II–6; pectoral II–14–IX; ventral I–5; scales 40+4 close above and along lateral line; tubular scales 28+3 in lateral line, 6 above and 12 below; 10 predorsal forward to occiput; cheeks, opercle and postocular scaly; small scales on chest, breast, prepectoral, and belly. Gillrakers 7+10, of which 3 or 4 above and below are rudiments.

Depth 4 to 4.2, head 2⅛ to 2.25, width 2 to 2⅓; snout 2⅞ to 3, eye 6 to 6.75 in head; eye 1⅞ to 2.2 in snout; interorbital equals eye. Text says maxillary reaches ⅔ to ¾ in eye, but figure shows it extending at least to posterior margin of eye; maxillary 2 in head.

A pair of very small close-set nasal spines; small antero-supraorbital spines rather low on each side; occipito-nuchal ridge long, fused, each ending in a small nuchal spine behind 2 postocular spines, posterior larger and above upper end of vertical preopercle edge; suprascapular spine rather large; 2 preorbital spines, both directed backward and posterior larger; suborbital stay with 1 or 2 feeble spines, ends in one behind

and another little above terminal one; 5 rather short, strong preopercular spines; 2 small divergent opercular spines, about opposite; no humeral spine.

Third and fourth dorsal spines longest, 3 to 3⅙ in head; second dorsal ray 2.75 to 3.12; caudal slightly concave behind, 1.66 to 1.87 in head; pectoral 1.25 to 1.33 in head, extending upon anal; ventral much shorter, 2.33 to 2.5 in head.

Nearly uniform pale brownish, fins all paler to nearly whitish; peritoneum blackish.

The type, 169 mm long, was taken by the "Albatross" off Point Tagolo, Zamboanga Province, Mindanao, in 200 fathoms. "Also a series from the Philippines in 162 to 226 fathoms." After Fowler.

Matsubara had a specimen 55.5 mm long from Kumano-Nada, Japan.

Genus SETARCHES Johnson

Setarches Johnson, Zool. Soc. London Proc. (1862) 177, type *Setarches güntheri* Johnson; Jordan and Evermann, U. S. Fish Comm. Bull. 23 part 1 (1905) 461; M. Weber, Siboga Exped. (Fische) 57 (1913) 491; Matsubara, Sigenk. Kenky. Trans. No. 2 (1943) 361.

Lioscorpius Günther, *Challenger* Reports Zool. (*Shore Fishes*) 1 (1880) 40, type *Lioscorpius longiceps* Günther.

Bathysebastes Steindachner and Döderlein, Denksche. Akad. Wiss. Wien (1884) 207, type *Bathysebastes albescens* Steind. and Döderl.

Pelagic or abyssal fishes of the Atlantic and Indo-Pacific oceans; species few.

Dorsal deeply notched, XI to XIII–9 to 11; anal spines III–4 to 6; pectoral broad and bony, with 20 or more rays all simple in young specimens, but the upper half branched in adults.

Head and body compressed; head scaleless above, its bones cavernous, interorbital flat; mouth terminal, broad, oblique; maxillary much expanded behind, reaching to or nearly to the posterior margin of eye; jaws equal or lower jaw projecting, with a small symphysial knob. Teeth villiform, in a rather narrow band on jaws, vomer, and palatines. Cranial spines weak and small; nasal, preocular, and parietal spines present; supraocular and postocular spines absent or else very small; lower edge of preorbital with 2 or 3 spines; 4 or 5 preopercular and 2 opercular spines. Lateral line a broad scaleless groove with 20 to 30 skinny tubes. Scales cycloid, minute to moderate. Dorsal deeply notched, the soft dorsal

shorter and with fewer rays than the spinous portion. Branchiostegals 6 or 7; peritoneum white; alimentary canal and the few pyloric appendages jet black.

Species few in deep water, in the Atlantic, Pacific, and Indian oceans.

SETARCHES GUNTHERI Johnson

Setarchces güntheri Johnson, Zool. Soc. London Proc. (1862) 178, Madeira, Atlantic Ocean; Goode and Bean, Oceanic Ichthyology (1895) 263, Madeira; M. Weber, *Siboga* Exped., Fische 57 (1913) 492, Bali Sea; Makassar Strait; Molucca Strait; Arafura Sea; Kei Islands; Flores Sea; Philippines; Fowler, Amer. Mus. Nat. Hist. Bull. 70 (1936) 929, Madeira.

Liscorpius longiceps Günther, *Challenger* Reports Zool. (*Shore fishes*) 1 (1880) 40, *plate 17, fig. C.* and 52; Station 192 at 129 fms., Kei Islands; and Station 204, at 705 fms., Philippines.

Atlantic and Pacific Oceans.

Station 204 was in the Sibuyan Sea, between Sibuyan and Tablas, south of Romblon, latitude 12° 28′ N., and longitude 122°15′ E. This is the only Philippine record.

Dorsal XI–9 or 10, rarely XII–9 or 11; anal III–5; pectoral 23; scales 86 in lateral line, with 30 tubules. Body elongate, compressed, depth 3.66, head 2.33, pectoral 2.66 times in the length; snout obtuse, 3.16, eye 6.2, maxillary 2.2, interorbital 4.75 times in the head. The hind edge of the small eye is midway in the head; mouth large, lower jaw protruding; maxillary reaches opposite hind margin of eye, its expansion nearly equal to eye. Two spines on lower preorbital ridge over maxillary; preopercular spines 5, along margin; 2 opercular spines; a small postocular spine, a broad nuchal spine, and a pair of small close-set spines just above opercle. Second dorsal spine 3 times in head, the second dorsal ray 2.87. The third anal spine is 3.66, the first anal ray 3, the truncate caudal 2, the ventral 2.25 in the head.

Uniform pinky red, minutely dotted with black; tongue and throat black. Length of Johnson's specimen 278 mm. Günther's specimens were small. His description does not agree with his figure.

Genus APISTUS Cuvier

Apistus Cuvier, Régne Animal, 10th ed. (1828) type *Apistus alatus* Cuv., Pondicherry, India; Bleeker, Verh. Akad. Amsterdam 16 (1876) 58; Jordan and Starks, U. S. Nat. Mus. Proc. 27 (1904) 146.

Pterichthys Swainson, Nat. Hist. 2 (1839) 265, type *Pterichthys carinatus* (Bl. and Schn.).

Polemius Kaup, Wiegmann's Archiv. (1858) 333, type *Polemius alatus* (Cuv.).

Small stinging fish along the coasts of Asia from India to Japan, and the islands between, and south to Australia.

The oblong compressed body is covered with small to medium-sized ctenoid scales; the head is without spinous crests above, the sides rough; the orbital rim serrate. Preorbital with 3 spines, the posterior one elongate and pointed backward; preopercle with 4 to 6 spines, the opercle with 2. The mouth is large, oblique, with teeth in the jaws and on vomer and palatines.

Dorsal fin XIV or XV–7 to 9, continuous, the membrane incised behind each spine; anal III–7 or 8; pectoral elongate, extending beyond anal, pointed, of 11 or 12 rays, the lowest ray free; ventral I–5; caudal rounded. A pair of barbels under the chin; a small slit behind the last gill arch.

Notable for the long pectorals, venomous spines, and regularly imbricated ctenoid scales. The various species described may be merely variants of a single wide-spread form, but this can only be settled by an examination of the types of the fishes of this genus, and of ample material collected throughout its range.

APISTUS ALATUS Cuv. and Val.

Apistus alatus Cuvier and Valenciennes, Hist. Nat. Poiss. 4 (1829) 289–392; Schlegel, Fauna Japonica Poiss. (1843) 49, *plate 22, fig. 2,* Nagasaki; Günther, Cat. Fishes 2 (1860) 131, Madras; Bleeker, Verh. Akad. Amsterdam 16 (1876) 59, *plate 3, fig. 5,* Batavia, Java; Kiusiu, Japan; Bleeker, Atlas Ichth. 9 (1878) *plate 412, fig. 6;* Ishkiawa and Matsubara, Cat. Fishes (1897) 50, Sagami Bay, Japan; Herre and Herald, Phil. Fishery Program, October, 1947; China Sea, off west coast of Cavite Prov., Luzon.

Long known from the coasts of India, China, Japan, and Java, it has recently been discovered in Philippine waters.

A number of species have been described, but Day long ago, and Matsubara recently, reduced all to synonyms of *Apistus carinatus* (Bloch and Schneider). They may be right, but without a comparison of the types such determinations remain doubtful. Until such time as a proper revision is made, and the existent types actually compared, it seems best to retain *A. alatus,* as there is no doubt about its type. The synonymy, except that of *A. alatus,* is therefore omitted.

Dorsal XIV or XV–8 to 9; anal III–7 or 8; about 60 transverse rows of scales but the number variable, often much more.

Depth 3.4 to 3.75, head 2.6 to 2.8, caudal 3.7 or 3.8, pectoral 1.5 to 1.7 in the length; the pectoral extends beyond the anal base and may reach the caudal base; the detached pectoral ray is much shorter, less than the head without the snout. Soft dorsal rays much higher than the dorsal spines.

In life more or less brown above, the belly nearly white; a large oval or elliptical black blotch between the 8th and 12th dorsal spines; soft dorsal with 3 or 4 broad brown or dusky cross bands; pectoral nearly black or purplish black, pale to whitish at the upper margin.

A fine typical specimen 75 mm long was taken by trawl in the China Sea off the coast of Cavite Prov., Luzon. This specimen is in Manila and hence not available; my notes on it are too fragmentary to allow of a more detailed description. Reaches a length of 130 mm.

Genus SCORPAENELLA Fowler

Scorpaenella Fowler, U. S. Nat. Mus. Proc. 85 (1938) 83, type *Scorpaenella cypho* Fowler.

Dorsal X–1 to 8; anal III–5; ventral I–5; dorsal origin far back, over the posterior part of the opercle, the fin deeply notched, the spines elevated with deeply incised membrane, the soft dorsal smaller and lower; body naked; head large, with well developed spines; pectoral rays all simple; teeth villiform, in narrow bands on jaws; teeth on vomer, none on the palatines; eye large, in anterior half of head; ventral origin inserted opposite pectoral origin, its spine long; lateral line complete, prominent, high on body; gill openings wide, with free and separate membranes.

SCORPAENELLA CYPHO Fowler

Scorpaenella cypho Fowler, U. S. Nat. Mus. Proc. 85 (1938) 84, *fig. 37.*

An East Indian species from the Molucca Passage.

Only known from a tiny specimen, 27 mm long, taken in 417 fathoms off March Island, Molucca Passage. It is almost certain to be found in the Philippines when deep sea investigations are conducted.

Depth 2.4; head 2.25; snout 4 in head; eye equals snout, greater than interorbital; maxillary 1.75 in head; interorbital 5. Gill rakers 3 plus 10.

A pair of small nasal spines; very small antero-supraorbital spine; large high prominent medio-supraorbital spine; pair of very small postero-supraorbital spines; occipital-nuchal keel ends behind in a single pair of nuchal spines; 3 divergent preorbital spines each side, anterior largest and directed forward; suborbital stay with 3 low spines; preopercular spines 5, the upper one largest on head; a single postocular spine and one at suprascapula; 2 rather widely divergent opercular spines.

Skin smooth, no filaments or flaps. Pores in lateral line 21, in membranous canal extending whole course.

Dorsal X–1 to 8 on figure, X–9 in text; third spine 2 in head, first branched ray 3; anal III–5, second spine 2.66, second ray 3.2 in head. Caudal convex, 2.2, the least depth of caudal peduncle 5 in head. Pectoral broad, extending above middle of anal, 1.3; ventral spine 1.8 in head.

Largely uniform brown, with obscure darker specks or spots on trunk and tail; fins pale, the ventral rays darker terminally.

After Fowler.

Genus AMBLYAPISTUS Bleeker

Amblyapistus Bleeker, Natur. Verh. Akad. 16 (1876) 70, type *Apistus taenianotus* Cuv. and Val.

A little group of small East Indian and Philippine marine fishes.

The undivided dorsal begins before or above the eye and is slightly united with the caudal, XV to XVII–7 to 10; the first dorsal spine short and pointed more or less forward; the second, third, and fourth divergent and much elevated, the rest of the fin of nearly uniform height. Anal III–5 to 8. The oblong compressed body is covered with minute rudimentary cycloid scales; the blunt head with concave or vertical profile, without spiny crests above; interorbital space convex. Preorbital with 2 backward directed spines; preopercular spines 3 to 5; opercular spines 2. Teeth on jaws, vomer, and palatines. Fin rays divided or simple. Pectorals rounded, without free rays; caudal rounded, more or less equal to the head. Branchiostegals 5 or 6.

Key to the Philippine species of Amblyapistus

A. Dorsal XVII–7 or 8; anal III–5 to 6

B. Dorsal and anal rays divided; anal higher than its length.

C. Dorsal origin above front margin of eye; pectoral and ventral not reaching vent ..... *A. crista-galli*

CC. Dorsal origin above middle of eye; pectoral and ventral extending beyond vent ..... *A. taenianotus*
BB. Dorsal and anal rays all simple; anal longer than high; dorsal origin before eye ..... *A. macracanthus*

AMBLYAPISTUS CRISTA-GALLI Günther

Tetraroge crista-galli Günther, Cat. Fishes 2 (1860) 134, Philippine Islands.

Amblyapistus crista-galli Herre, Pan-Pac. Research Inst. Jour. 8 (1933) 9, Dumaguete, Negros Oriental Province; Herre, Bur. Sci. Coll. 1920–28; Cebu, Cebu Prov.; reefs between Cebu and Bohol; Dapitan, Zamboanga Prov., Mindanao; Herre, Fishes 1931 Phil. Exped. (1934) 65, Dumaguete.

Apistus taenianotus Richardson, Voy. *Samarang*, Fishes (1848) 5, *plate 4, figs. 1–2*, coast of China.

Langatondon. A Philippine and China Sea species.

Dorsal XVII–7; anal III–5; pectoral I–10 or 11; ventral I–5. Scales cycloid, very small, depressed and more or less imbedded, about 85 transverse rows from the upper angle of the opercle to the caudal; no scales on the head. Lateral line well marked, from above the upper angle of the gill opening to the middle of the tail, with 20 to 24 pores.

The somewhat oval body is much compressed laterally; its greatest depth, just in front of the ventral fins, is 2.65 times in the length, and a trifle more than the length of the head, which is 2.76 in the length or 4 times in the length including the tail. The caudal is more or less irregularly rounded, 3.28 in the length. The eye is 3.84 in the head, and greater than the nearly vertical snout, which equals the interorbital, 5 in the head. The rather blunt preorbital spine is about two-thirds of an eye diameter. The mouth is oblique, the maxillary extending beneath the anterior third of the eye. There are 4 spines on the preopercular margin, the upper one much the strongest; 2 opercular spines, the upper one larger and extending farther back than the other, and pointed diagonally upward and backward. The gill membranes are slightly continuous under the throat, as Günther states, but he is incorrect in stating "not attached to the isthmus between," for they are distinctly attached.

The dorsal begins above the front margin of the eye and continues to the caudal, to which it is slightly attached; the first dorsal spine is short and stout, its length more than an eye diameter and a third of that of the second spine, which is shorter than the head; the second spine equals the caudal, 3.28 times in the length. The second, third, and fourth spines

are much higher than the rest of the dorsal, their convex membrane high above the rest of the fin, which is of uniform height. The anal is low, the first and second spines short, the third 2.6 times an eye diameter and equal to the ventral, 4 times in the length of body and head. The pectoral reaches a vertical from the anus, 3 times in the length. The ventral does not reach the anus; its inner ray is attached to the belly by a membrane.

The color in life is more or less reddish brown, with darker spots here and there; the lateral line usually dusky brown; two large dusky brown spots between it and the dorsal, on a dark brown line parallel with the dorsal base. All the fins brown with a narrow white margin; dorsal and caudal with some black spots. The color is little changed in preservative.

Described from 3 specimens, 46 to 69 mm in length, taken at Dumaguete, Negros Oriental Province, where it is common on the coral reef. Reaches a length of 80 mm.

AMBLYAPISTUS TAENIANOTUS (Cuv. and Val.)

Apistus taenianotus Cuvier and Valenciennes, Hist. Nat. Poiss. 4 (1829) 257; Bleeker, Nat. Tijds. Ned. Ind. 3 (1852) 557, Amboina.
Platypterus taenianotus Swainson, Nat. Hist. 2 (1839) 265.
Tetraroge taenianotus Günther, Cat. Fishes 2 (1860) 136, Japan; Madras, India; Meyer, Soc. España Hist. Nat. Madrid Anal. 14 (1885) 21, Cebu, Cebu.
Amblyapistus taenianotus Weber, Siboga Exped. Fische 57 (1913) 498, Philippines; Herre, Fishes 1940–41 Phil. Exped., Dumaguete, Negros Oriental Province.

East Indies, India, and Japan. Known in the Philippines from Cebu and Dumaguete, and undoubtedly occurring throughout the Visayan Islands, on the shores of Mindanao, and in the Sulu Archipelago.

Dorsal XVII–8; anal III–5 or 6; pectoral I–10 or 11; fin rays all divided. Head obtuse, its anterior profile concave, 3.6 times, the depth 2.7, and caudal 3⅓ in the length. The eye is about 3.75 times in the head, the convex interorbital breadth half or two-thirds an eye diameter. Body everywhere with minute rounded cycloid scales almost covered with skin. Dorsal beginning above eye, the first 5 spines strongly divergent; the first shorter than or scarcely equal to the eye, the next 3 much longer; the second spine equal to the head to the end of the opercular flap, the third equals head from tip of snout to upper angle of gill opening. The third anal spine is much longer than the others, 2 to 2½ times an eye diameter,

the anal rays nearly 3 times as high as the length of their base, the dorsal and anal rays about equal in height. The rounded pectoral equals or slightly exceeds the head and extends to a vertical from the anal origin. The rounded ventral reaches just beyond the vent.

Color dusky red to dusky brown, with a brown or blackish spot between the fifth and seventh dorsal spines; occasionally the spot may be absent. Fins more or less spotted to brown or blackish.

My specimens were 65 to 73 mm in length; attains 116 mm.

AMBLYAPISTUS MACRACANTHUS Bleeker

Apistus macracanthus Bleeker, Nat. Tijds. Ned. Ind. 3 (1852) 267, Wahai, Ceram; Bleeker, Verh. Akad. Amsterdam 14 (1862) 107, Batjan; Ceram.

Tetraroge macracanthus Günther, Cat. Fishes 2 (1860) 133, Sea of Wahai, North Ceram; after Bleeker.

Amblyapistus macracanthus Day, Fishes India (1878) 158, *plate 38, fig. 3,* Andaman Islands; Bleeker, Verh. Akad. Amsterdam 16 (1876) 73, *plate 1, fig. 1,* Labuha, Batjan; Wahai, Ceram; Herre and Herald, Manila Bay near Corregidor, Luzon; May, 1948; 65 to 75 mm long.

An East Indian and Philippine species, occurring also in the Andaman Islands.

Dorsal XV–9 or 10; anal III–8; pectoral I or II–10; all fin rays are simple.

The depth of the oblong, laterally compressed body is 3, the head 3.1, the caudal about 3.25 in the length. The anterior profile of the blunt head is concave. The eye is 3.8 in the head, a little longer than the snout or convex interorbital. Body covered everywhere with minute rudimentary scales, almost buried but not covered with skin. Dorsal beginning before the eye, the first 5 spines strongly divergent; the first spine is shorter than the eye, the 3 following greatly elevated, the second as long as the head, the third as long as the head without the snout, the fourth much shorter. Third anal spine 1.5 times the eye, the rayed portion longer than high. The rounded pectoral equals the head and extends to the anal origin or beyond; the ventral scarcely reaches the vent.

Color of body and fins brown or yellowish dusky.

A rare species only known in the Philippines from Manila Bay at 15 to 25 fathoms. Probably common enough in the central and southern Philippines and East Indies, but living in deeper water than the other species and therefore, not taken by the fishing methods prevalent in the Islands.

Genus PARACENTROPOGON Bleeker

Paracentropogon Bleeker, Versl. Akad. Amsterdam **16** (1876) 66, type *Paracentropogon longispinis* Bleeker; Jordan and Starks, U. S. Nat. Mus. Proc. **27** (1904) 167.

The oblong laterally compressed body is covered with very small scales imbedded in the skin. The obtuse head is without spiny crests above. The preorbital has 2 spines, the hind margin of the preopercle 4 or 5, and the opercle 2. The moderate mouth is slightly oblique, with teeth on the jaws, vomer, and palatines. Fin rays divided, or in part simple; dorsal beginning above the eye, not divided, spines 12 to 15, the anterior ones strongly divergent, not elongate; rays 8 or 9. Pectorals rounded, without free rays; ventrals with 4 or 5 rays; anal III–4 to 6; branchiostegals 6.

A marine genus of the East Indies, Philippines; and the coasts of China, Malaya, India, and Ceylon. Small brightly colored fishes with venomous stinging spines. Three species are known, of which two occur in the Philippines.

Key to the species of Paracentropogon

A.—Caudal rays 14; second and third dorsal spines 2 in head.... *P. indicus*
AA.—Caudal rays 12; second and third dorsal spines 1.1 to 1.3 in head. *P. longispinis*

PARACENTROPOGON INDICUS (Day)

Centropogon indicus Day, Fishes India (1878) 155, *plate 38, fig. 2*, Madras, India; length about 63 mm.

Paracentropogon indicus Jordan and Richardson, U. S. Bur. Fish. Bull. **27** (1908) 280, Cuyo, Cuyo Islands, Philippines; length 50 mm.

This little fish occurs from the east coast of India to the Philippines. Further material is needed to settle whether it is really distinct from *P. longispinis*.

Dorsal XIV–8; anal III–5; pectoral 10; caudal 14; ventral I–4; scales 80.

The depth is 3.25, the head 2.55, the caudal 4.6 times in the length. The eye is a fourth longer than the snout, 3.6 times in the head, the snout 4.5, the slightly rounded caudal 1.8. The interorbital space is slightly concave, its breadth two-thirds an eye diameter. The preorbital has a strong spine extending to the last third or hind edge of the eye; a small spine at its base. The uppermost preopercular spine is strong, its length two-thirds an eye diameter; below it are 5 more blunt short spines along the preopercular margin; opercle with

2 spines. The anterior dorsal spines are divergent, their membrane incised, the second and third longest, twice in the head, and longer than the dorsal or anal rays. The third anal spine equal to the longest dorsal spine.

The pectoral equals the depth; the ventral reaches the anus.

Color pinkish, with irregular markings over the head, the cheeks barred with pinkish and brown vertical bands; 3 or 4 badly defined vertical bars on the body, the last over the base of the caudal fin; a vertical brown band over the last third of caudal fin; posterior third of anal banded; ventral nearly black in its last half.

Madras, India.

After Day.

PARACENTROPOGON LONGISPINIS (Cuv. and Val.)

Apistus longispinis Cuvier and Valenciennes, Hist. Nat. Poiss. 4 (1829) 300; Quoy and Gaimard, Voy. *Astrolabe*, Poiss. (1834) 694, *plate 11, fig. 4.*

Tetraroge longispinis Günther, Cat. Fishes 2 (1860) 134, China; Amboina; Bengal; Borneo; Ceylon; Günther, *Challenger* Reports, Zool. (*Shore Fishes*) 1 (1880) 52, Philippines.

Paracentropogon longispinis Bleeker, Verh. Akad. Amsterdam 16 (1876) 67, Singapore; Celebes; Borneo; Buru; Ceram; Amboina; Saparua; Banda Neira; Jordan and Richardson, U. S. Bur. Fish. Bull. 27 (1908) 280, Cuyo, Cuyo Islands; Herre, Fishes 1931 Phil. Exped. (1934) 65, Unisan, Tayabas Prov., Luzon; Herre and Herald, 1948 Collection; near Corregidor, Manila Bay, Luzon.

Amblyapistus longispinis Day, Fishes India (1878) 157, *plate 38, fig. 4,* seas of India to China.

Apistus fuscovirens Cuv. and Val., Hist. Nat. Poiss. 4 (1834) 301 (409); Quoy and Gaimard, Voy. *Astrolabe*, Poiss. (1834) 695, *plate 11, fig. 5;* Bleeker, Nat. Tijds. Ned. Ind. 3 (1852) 269; Amboina and Ceram.

Centropogon fuscovirens Günther, Cat. Fishes 2 (1860) 130, after Bleeker; Meyer, Soc. España Hist. Nat. Madrid Anal. 14 (1885) 21, Cebu, Cebu.

Platypterus fuscovirens Swainson, Hist. Nat. 2 (1839) 265.

Apistes multicolor Richardson, Voy. *Samarang,* Fishes (1848) 3, *plate 4, figs. 3–4,* Sea of China.

Apistus hypselopterus Bleeker, Nat. Tijds. Ned. Ind. 2 (1851) 238, Banda Islands.

Gymnapistus hypselopterus Bleeker, Versl. Akad. Amsterdam 16 (1864) 360, Saparua.

? Centropogon robustus Meyer, Soc. España Hist. Nat. Madrid Anal. 14 (1885) 20, Cebu, Cebu. This is an Australian fish and its occurrence in the Philippines is improbable.

A fish of the East Indies, Malaya, Philippines, and China. Known in the Philippines from the Cuyo Islands; Cebu; Unisan,

Tayabas Province, and Manila Bay, Luzon. No doubt it occurs generally throughout the Islands.

Dorsal XIV–8; anal III–5; pectoral I–9 (to 11); caudal 12; fin rays all divided; scales 70 to 75.

The oblong body is compressed, the dorsal profile convex above the pectoral area, the depth equal to the blunt head, 2.8 times, the rounded caudal 3.64 in the length; the anterior profile of the head descends in a straight line from the dorsal origin to the tip of the snout, which is 3.66 in the head and a little less than the eye, which is 3.35; the interorbital two-thirds an eye diameter. There is a very small cirrus above the eye. The upper preorbital spine much longer than the lower one, equal to the eye and extending to, or nearly to, the hind margin of the eye. The maxillary extends beyond the middle of the eye in my specimen. Preopercular spines 5, the upper one much longer than the others. No scales before the dorsal, on the shoulder, and on the throat and chest; those on the body small but distinctly visible, most of them partly immersed in the skin; lateral line prominent, with about 20 conspicuous tubules. The dorsal begins above the eye, not divided; the second, third, fourth, and fifth spines strongly divergent and much further apart than the rest, the second and third longest, 1.1. to 1.3 in the head. The membrane between the 5 anterior spines deeply incised and all the spines with free tips; pectoral obtusely rounded, a little shorter than the head; third anal spine much longer than the others, a little more than twice the eye in length; the anal rays obtusely rounded, equal to the dorsal rays in height.

The color is uniform reddish dusky, becoming brown in preservative; a blackish area on the upper part of the head and extending over most of the first 3 dorsal spines; a large black spot on the basal part of the fifth to eighth dorsal spines, continued downward below the lateral line; behind it and just above the lateral line an oblong whitish patch, the rest of the body mottled brown and blackish, with paler oblique streaks; caudal blackish, with pale transverse stripes; pectoral membrane black, the rays mottled with paler; ventrals black.

Here described from a specimen 62 mm long, obtained from Manila Bay, near Corregidor, at a depth of 23 to 27 fathoms. Reaches a length of 102 mm.

Genus GYMNAPISTES Swainson

Gymnapistes Swainson, Nat. Hist. 2 (1839) 265, type *Apistus marmoratus* Cuv. and Val.

Gymnapistus Bleeker, Verh. Akad. Amsterdam **16** (1876) 83.

A genus found from India to the Philippines; species marine, but at least one enters fresh water.

Dorsal spines XII to XIV; rays 8 to 10; anal III–5 to 8; branchiostegals 7.

The oblong compressed body is scaleless, the skin entirely smooth or with minute prickles; the head is obtusely convex; preorbital with 2 spines below; preopercle with 3 to 5 spines on the posterior margin, the opercle with 2; vomerine and palatine teeth present. Dorsal continuous, the first four anterior spines strongly divergent, the membrane nearly entire or deeply incised; dorsal origin above or just behind the eye.

Two species are known from the Philippines.

Key to the Philippine species of Gymnapistes

A.—Pectoral extending upon the anal, equal to or but little shorter than the head; under side of body white ..... *G. leucogaster*

AA.—Pectoral not reaching to anus and much shorter than the head; under side of body more or less dusky to blackish ..... *G. niger*

GYMNAPISTES LEUCOGASTER Richardson

Apistus leucogaster Richardson, Zool. Voy. *Samarang*, Fishes (1848) 5, *plate 5, figs. 1–2*, Sea of China; Bleeker, Nat. Tijds. Ned. Ind. 4 (1853) 111, Amboina.

Prosopodasys leucogaster Günther, Cat. Fishes 2 (1860) 141, China; Kner and Steindachner, Sitzungsber. Akad. Wiss. Wien 58 (1868) 309; Playfair, Zool. Soc. London, Proc. (1869) 240, Zanzibar.

Gymnapistus leucogaster Bleeker, Verh. Akad. Amsterdam 16 (1876) 88, *plate 4, fig. 1*, Amboina, Ceram, Timor; M. Weber, *Siboga* Exped., (Fische) 57 (1913) 502, Lombok.

A species of the East Indies and Philippines, extending north to the coast of China, and westward in the Indian Ocean to Zanzibar.

Dorsal XIII–8; anal III–6 to 8; pectoral I–14 to 15.

The body is heavy anteriorly, compressed posteriorly, the depth 2.66 to 2.7, the thick robust head 2.5 to 2.58, the small caudal 3.5 times in the length. A prominent bony arch over the eye, which is 3⅙ in the head, the interorbital width is twice in the eye. The spinous dorsal begins above the middle of the eye, the first 3 spines divergent, the third spine longest, twice as high as the first spine; dorsal membrane of all the spines deeply incised, not merely the anterior ones as shown in Bleeker's figure; dorsal and anal spines all weak. Pectoral extending back to above the second anal spine; its length equal

to that of the caudal; ventral extending to the anus, its strong spine 6 times in the standard length.

The mouth is oblique, the chin prominent, the maxillary extending beyond the posterior margin of the eye; preorbital with 2 backward directed spines, the posterior one much the larger. The eye has 2 or 3 cirri on the upper part of the eyeball, as in *Decterias* and *Minous*. There are 5 spines on the posterior margin of the preopercle, the strong sharp uppermost one at the end of the suborbital ridge, the others more or less blunt; 2 divergent opercular spines. No flaps or barbels present.

Color in preservative is brown marbled with darker brown, the lower half of the trunk white, all more or less suffused with pinkish; dorsal and pectorals mottled or banded with brown, a large blackish brown spot on the bases of the fifth to eighth spines; caudal and ventrals reddish with black tips; anal rosy, the rays more or less tipped with blackish. In life this fish is largely rose red.

Here described from 2 specimens, 48 and 49 mm in length, taken from Manila Bay in 15 to 25 fathoms.

GYMNAPISTES NIGER (Cuv. and Val.)

Apistus niger Cuvier and Valenciennes, Hist. Nat. Poiss. 4 (1829) 305 (415), mouth of Ariancoupang River, Pondicherry, India.

Prosopodasys niger Günther, Cat. Fishes 2 (1860) 141, Amboina.

Gumnapistus niger Bleeker, Verh. Akad, Amsterdam 16 (1876) 86, *plate 3, fig. 4*, Sumatra; Nias, Bali, Celebes, Buru, Amboina; Day, Fishes India (1878) 156, *plate 37, fig. 5*, very numerous at the Andaman Islands; M. Weber, Nova Guinea 5 (1903) 263, mouth of the Klipong River, north New Guinea; M. Weber, *Siboga* Exped. Fische 57 (1913), 502, on reef, Menado, Celebes; Fowler, Bernice P. Bishop Mus. Mem. 10 (1928) 297, after Günther.

Gymnapistes niger Herre, Pan-Pac. Res. Inst. Jour. 8 (1933) 9, vicinity of Dumaguete, Negros Oriental Prov., Philippines; Herre, Fishes 1931 Phil. Exped. (1934) 65, Nasugbu, Batangas Prov., and Unisan, Tayabas Prov., Luzon; Tanjay River, Negros Oriental Prov., Philippines; Herre, Indian Mus. Mem. 13 (1941) 372, India, East Indies, and Philippines; Herre, Fishes 1940–41 Exped., Old Ayukitan, Negros Oriental Prov.; Cagayan River, near Cagayan, Misamis Oriental Prov., Mindanao.

Apistus amblycephalus Bleeker, Nat. Tijds. Ned. Ind. 1 (1851) 27, Padang, Sumatra.

Tetraroge emblycephalus Günther, Cat. Fishes 2 (1860) 133, Sea of Padang, Sumatra; after Bleeker.

Apistus amblycephaloides Bleeker, Nat. Tijds. Ned. Ind. 4 (1853) 259, Sumatra.

The Zambales-Negrito name is "Napo." Occurs from India to the Philippines. Living on reefs in the sea, in river mouths, and in gravelly or rocky places in rivers, sometimes a long way from the sea.

Dorsal XIII–8; anal III–5; pectoral I–11.

The oblong compressed body is thick, deep, and robust anteriorly, the depth 2.6 to 2.8 in the length. The large deep blunt head is 2.24 to 2.37 in the length, its anterior profile descending in an almost straight line from the base of the second dorsal spine to the tip of the snout, or more convex in some specimens. The interorbital is high, equal to the eye, which is 4.75 times in the head; the blunt snout is an eighth more than the eye; the mouth is oblique, the broad maxillary extending beyond the hind margin of the eye, 2½ times in the head. No cirri on or above the eye, and no flaps or tentacles anywhere. Preorbital with 2 spines, the anterior lower one rudimentary, the upper and posterior one much larger, extending beneath the middle of the eye, its length ⅔ an eye diameter; 3 or 4 blunt rudimentary preopercular spines, but the preopercular stay ending in a large strong spine equal or nearly equal to the eye; opercle with 2 flat concealed spines.

Dorsal beginning just above or behind the posterior margin of the eye, the first 4 or 5 spines, divergent and with more or less incised membrane, the first spine very short, the second or second and third spines longest, 2.7 times in the head. Pectoral broad, obtusely rounded; ventral and pectoral about equal, 1.65 in the head or 3.9 in the length, not extending to the anus when depressed. Caudal rather small, 3.4 to 4 in the length.

Life color in fresh water nearly black except beneath, where it is nearly white with a roseate flush, freckled and mottled with reddish brown. In preservative the colors change but little; all the fins with a white margin; caudal reddish brown, with a broad blackish submarginal band.

Here described from a male 90 mm long, a female 85 mm long, but bulkier than the large male, and 2 other specimens 60 and 70 mm in length. They were taken from the Bangan Labad river, at Villar, Zambales Province, Luzon. This is a mountain stream, Villar being 42 kilometers from the China Sea.

We may include this dangerous stinging fish in our list of Philippine fresh-water inhabitants, and it is probable that it occurs in rivers all the way from India to New Guinea. It

cannot be dismissed as merely a migrant from estuarine or tidal waters. I secured it in the Tanjay River, Negros Oriental Province, 8 kilometers or so from the sea, in a gravelly rapid. In the Cagayan river, Misamis Oriental Province, Mindanao, I found it in the same kind of habitat, 16 or 18 kilometers from the sea.

Genus TETRAROGE Günther

Tetraroge Günther, Cat. Fishes 2 (1860) 132, type *Apistus barbatus* Cuv. and Val.

A genus of the East Indies and Philippines, with but one species.

The head and body are compressed, the skin naked. The preorbital is armed with a long backward-pointed spine, the preopercle with a still larger one. Dorsal undivided, its origin over the eye, with 13 spines, the second and third much elevated, the rest of uniform height; anal III–5 or 6. Pectoral without appendages or free rays. Teeth in jaws and on the vomer and palatines. A pair of barbels on the chin. An air bladder is present; no cleft behind the fourth gill.

TETRAROGE BARBATA (Cuv. and Val.)

Apistus barbatus Cuvier and Valenciennes, Hist. Nat. Poiss 4 (1829) 413; Bleeker, Soc. Ind. Neerl. Act. 1 (1856) 36, Amboina.

Tetraroge barbata Günther, Cat. Fishes 2 (1860) 133, Molucca Sea; Jordan and Richardson, U. S. Bur. Fish. Bull. 27 (1908) 280, Aparri, Cagayan Prov., Luzon; length 2 inches; Herre, Fishes 1931 Phil. Exped. (1934) 65, Cotabato, Cotabato Prov., Mindanao; specimen 41 mm long; Herre, Fishes 1940–41 Exped.; Cagayan River, 10 kilometers from the sea, near Cagayan, Misamis Prov., Mindanao; 4 specimens 21–35 mm in length.

Apistus melas Bleeker, Nat. Tijds. Ned. Ind. 1 (1851) 26; Bleeker, Nat. Tijds. Ned. Ind. 3 (1852) 270, Amboina.

Gymnapistus barbatus Bleeker, Verh. Akad. Amsterdam 16 (1876) 85, *plate 4, fig. 5*, Sumatra, Java, Celebes, Amboina; Bleeker, Atlas Ichth. 9 (1878), *plate 417, fig. 3*.

Only known from the East Indies and the Philippines. A marine fish but entering rivers at times.

Dorsal XIII–8; anal III–5 or 6; pectoral 11 or 12, all branched. The oblong body is much compressed, its height appproximately equal to the head, 2.66 times in the length. The eye equals the snout, a little more or less than 4 in the head; the convex interorbital space equal to or two-thirds the diameter of the eye. Preorbital with a large sharp spine extending beneath or well beyond the posterior margin of the

eye; 3 to 5 spines on the preopercle, the upper one at the end of the suborbital stay conspicuously large and sharp; 2 divergent opercular spines. The mouth is oblique, the maxillary extending beneath the posterior half of the eye or beyond; beneath the tip of the lower jaw is a pair of red barbels, usually shorter than the eye.

The dorsal begins above the middle of the eye, the first spine about twice in the eye; the second and third spines elevated to form a crest, their membrane not incised, the second spine longest, 1.66 times in the length of the head. The third anal spine longest, nearly twice the eye, the anal rays shorter and lower than the soft dorsal; the obtusely rounded pectoral equals or is but little shorter than the head; the rounded caudal is 1.5 times in the head.

No scales, the skin transversely striate to minutely wrinkled, or sparsely and minutely granulate.

The color is blackish or dusky brown, the back and outer parts of the fins darkest, the caudal transversely barred; black specks may be sprinkled over the body; paler colored specimens show dusky brown stripes or marblings; all fins except the spinous dorsal with a pale edge, apparently yellow in life.

This marine fish is evidently of general occurrence throughout the Philippines, specimens having been taken from Aparri, at the northeast corner of Luzon, to Mindanao. It should be looked for also in swift stretches of river mouths with gravelly bottom, near the sea. It reaches a length of a little more than 100 mm.

Genus PROSOPODASYS Cantor

Prosopodasys Cantor, Asiat. Soc. Bengal Journal **18** (1849) 251, type *Apistus trachinoides* Cuv. and Val; Günther, Cat. Fishes **2** (1860) 139, in part; Bleeker, Verh. Akad. Amsterdam **16** (1876) 76, in part.

A genus of East Indian, Malayan, and Philippine waters.

The body is covered with minute rudimentary non-imbricate scales embedded in the skin. Teeth on the jaws and on the vomer and palatines. The 3 anterior dorsal spines are entirely separated from the rest of the fin, or nearly so, by a deep notch; the remaining dorsal spines of uniform height, each with its membrane incised so that the tip is free; the spinous dorsal much longer than the soft dorsal; preorbital with a rudimentary forward-projecting spine or spines, and a long backward-directed spine.

Dorsal III–XII–7 or 8; anal III–3 to 5; ventral I–4 or 5. No cleft behind the fourth gill. The lateral line is axial, extending to the caudal peduncle.

Species few, apparently confined to the East Indies and Philippines.

Key to Philippine species of Prosopodasys

A.—Three anterior dorsal spines entirely separated from rest of dorsal.
B.—Three anterior dorsal spines separated basally from remaining spines by a bare space equal to half an eye diameter....*P. gogorzae*
BB.—No bare space separating first and second spinous dorsals.
C.—Profile of head boldly convex; back elevated ..... *P. cypho*
CC.—Profile of head nearly horizontal and slightly concave. *P. depressifrons*
AA.—Three anterior dorsal spines separated by a deep notch not extending to base of spine and connected to rest of fin by a basal membrane ..... *P. zonatus*

PROSOPODASYS GOGORZAE (Jordan and Seale)

Prosopodasys gogorzae Jordan and Seale, U. S. Nat. Mus. Proc. 28 (1905) 792, Bais, Negros Oriental Prov., Philippines.

Vespicula gogorzae Jordan and Richardson, Check List Fishes Phil. Arch. (1910) 52, Bais, Negros Oriental Prov., Philippines; Herre, Pan-Pac. Research Inst. Jour. 8 (1933) 9, vicinity of Dumaguete, Negros Oriental Prov.

A Philippine species only known from the type.

Dorsal III–XII–4; anal III–4; pectoral I–9–II. Body compressed, depth 3, head 2.75 in the length; eye, snout, and interorbital equal, 4 in head. Preorbital with 2 hooked spines anteriorly; 4 spines on posterior margin of preopercle, the upper one much stronger and sharper than the others; 2 divergent opercular spines. Spines not strongly developed on head; postorbital, parietal, nuchal spines present. Scales rudimentary; mouth large, nearly vertical; maxillary extending beneath posterior margin of pupil.

First 3 dorsal spines entirely detached, separated from the rest of the fin by a distance equal to the eye. Third anal spine longest and strongest, 1.50 in head; pectoral equal to head, extending beyond anal origin; ventrals broadly attached to belly, 1.50 in head; caudal equals head.

Color in spirits dull grayish, more or less marbled with pale brown; two rather distinct brown bands on posterior of body, the posterior one occupying the caudal peduncle a rather indistinct irregular brown band across interorbital and from eye obliquely down cheeks; another irregular line near posterior mar-

gin of opercles; dorsal fin grayish, the black bands of the posterior part of the body extending into the fin; posterior third of anal fin dusky with white tip; the middle portion of the fin is white; the anterior portion gray; caudal with black line at base and two dark lines on its posterior third, otherwise fin white; pectorals dusky with irregular rows of black spots; ventrals black at tip, grayish anteriorly.

The only specimen known was taken at Bais, Negros Oriental Prov., its length 1.15 inches.

After Jordan and Seale.

PROSOPODASYS CYPHO Fowler

Prosopodasys cypho Fowler, U. S. Nat. Mus. Proc. 85 (1938) 86, *fig. 39.*

A Philippine species.

Dorsal III–XII–7 according to the figure; text says III–X–8; anal III–5; pectoral I–11; ventral I–5; gillrakers short weak points, 3+7.

The head and depth are approximately equal, 2.5 in the length or 2.6 according to the figure; eye large, a little more than snout, 4 in head, but the figure shows 3.1. Preorbital spine small, sharp, less than half eye; 3 or 4 spines on the preopercle, the upper one strong, sharp, more than half the eye. Maxillary extending beneath middle of eye, 2.3 in head. Body deep, the dorsal and ventral outlines nearly alike, broadly convex, the anterior profile of the head convex to the tip of the lower jaw.

Dorsal origin over hind margin of eye, the second and third spines highest, equal, 1.76 times in head; longest dorsal ray 1.7, third anal spine 2.4 in head; caudal evenly rounded, 1.2 in head; pectoral equal to head, extending well over the anal.

Brown, slightly paler on head and belly below. Head with broad whitish frontal band, one down from front of eye over maxillary expansion, another from hind eye edge over cheek and vertical limb of preopercle. White bar at pectoral base. Dorsals dark brown. Second dorsal with whitish longitudinal streak subbasal, above which on middle of fin from fifth to ninth spines is broad blackish brown blotch. Soft dorsal with darker brown transverse waved lines or bars. Anal with 3 or 4 broad slightly darker transverse bands. Caudal with 2 brown bands crosswise, a posterior broader dark basal bar,

and 4 terminal waved dark transverse lines of bands with intervening pale whitish areas. Paired fins blackish brown.

Only the type specimen, 45 mm long from Davao, Mindanao. After Fowler.

As Fowler remarks, its elevated back, proportions, and coloration separate it from other members of the genus. The first dorsal, pectoral, and ventral are all different from the other species.

PROSOPODASYS DEPRESSIFRONS (Richardson)

Apistus depressifrons Richardson, Zool. Voy. *Samarang,* Fishes (1848) 5, *plate 3, figs. 1–2,* Java (Sea of Japan by error).

Prosopodasys depressifrons Günther, Cat. Fishes 2 (1860) 140, Java; Bleeker, Verh. Akad. Amsterdam 16 (1876) 80, *plate 3, fig. 2,* Sumatra, Nias, Java, Celebes, Batjan, Buru, Amboina; Bleeker, Atlas Ichth. 9 (1878) *plate 412, fig. 1.*

Vespicula depressifrons Herre, Fishes 1931 Phil. Exped. (1934) 65, Cotabato, Cotabato Prov., Mindanao.

Apistus binotopterus Bleeker, Nat. Tijds. Ned. Ind. 1 (1851) 26.

Apistus plagiometopon Bleeker, Nat. Tijds. Ned. Ind. 3 (1852) 753.

A small fish of the East Indies and Philippines.

Dorsal III–IX or X–6 to 8; anal III–5; ventral I–5 pectoral I–9.

The body is elongate, compressed, the depth 3.27, the head 2.88, the rounded caudal 3.6, the rather narrow elongate pectoral 2.5 times, the ventral 3.8 in the length; the eye is high up, impinging on the dorsal profile and in the anterior half of the head, equal to the snout, four and a sixth times in the head; the maxillary extends to the middle or hind margin of the eye, twice in the head. The back is moderately convex, the profile from the dorsal origin to the snout nearly horizontal and gently concave; the interorbital space much narrower than the eye. The mouth is nearly vertical, the lower jaw prominent, with a symphyseal knob.

The body is covered with minute non-imbricate cycloid embedded scales, crowded in the middle but sparse anteriorly. The first three dorsal spines divergent, entirely separated from the others, the second and third equal and longer than the rest, except the last which is of equal height, twice in the head. The third anal spine is longest, 1.78 in the head. The pectoral extends to above the second or third anal spine. The preorbital has 2 well developed spines, the posterior one longest, sharp, projecting downward and backward, 1.5 times in the eye, and equal to the upper preopercular spine; the 3 lower

preopercular spines small and blunt; opercle with 2 divergent spines.

The color of body and fins is dusky red; the dorsal and anal rays, pectoral, and ventrals dark purple to dusky brown; the caudal is transversely barred with bluish white and dusky spots.

Bleeker had 64 specimens, from 45 to 96 mm long. My 7 specimens from Cotabato, Cotabato Province, Mindanao, were 31 to 45 mm in length.

PROSOPODASYS ZONATUS M. Weber

Prosopodasys zonatus M. Weber, *Siboga* Exped. Fische 57 (1913) 502, *plate 10, fig. 8.*

Known only from North Ubian, an island in the Sulu Archipelago, and from the Postillon Islands in the Dutch East Indies. The Philippine specimen, 52 mm long, was taken at a depth of 16 to 23 meters; the East Indian example, 35 mm long, from a depth of 36 meters.

Dorsal XV–7; anal III–4; pectoral II–9; ventral I–4; caudal 2–12–2. The height is 3⅓ to 3.75 times, the head 3⅓ in the length; the eye is 2.66 in the head; the anterior profile is a very steep straight line from the dorsal origin to snout tip. The dorsal origin is over the middle of the pupil. The first four spines diverge and are farther apart than the rest are; the first spine points upward and forward, and equals the eye; the second spine is erect, the third one diverges backward from it, while both are a fourth longer than the eye, as is also the third anal spine; the dorsal and anal rays and all pectoral rays, except 2 or 3 upper ones, are divided.

The preorbital has a rudimentary spine pointing forward and one equal to the eye pointing backward. The preoperculum has a long upper spine, and below it is a small one directed downward. Vomer and palatines with teeth.

The fourth gill slit is closed. Small rounded scales, which hardly touch each other, are imbedded in the skin. Lateral line with 15 to 19 tubules.

The ground color in alcohol of the female specimen was rosy, dusted with brown specks; beneath the tenth dorsal spine was a vague white spot, just above the lateral line. Beneath the last dorsal rays a brown-edged and nearly white band surrounds the caudal peduncle; the fins are mottled with brown. The male specimem had a similar white stripe between the second and third dorsal spines and the lateral line; a dusky spot

between the 5th and 8th dorsal spines, edged by 2 diagonal whitish stripes.

After Weber.

Genus ACANTHOSPHEX Fowler

Acanthosphex Fowler, U. S. Nat. Mus. Proc. 85 (1938) 86.

As yet only known from the China Sea near Hong Kong.

Body elongate ellipsoid, compressed, naked. Head moderate, compressed. Fine teeth in jaws and on vomer, none on palatines. Two short barbels at chin? Suborbital spines long, both project backward behind eye. Preopercular spines all enlarged and long. Spines of first dorsal longest of dorsal series; first fin also separated from second spinous section. A single feeble short anal spine.

Type, *Prosopodasys leurynnis* Jordan and Seale.

After Fowler.

The original description of *Prosopodasys leurynnis* says nothing of any chin barrels, neither does the figure indicate them. Fowler's statement is therefore, doubtful.

ACANTHOSPHEX LEURYNNIS (Jordan and Seale)

Prosopodasys leurynnis Jordan and Seale, U. S. Nat. Mus. Proc. 29 (1905) 525; Hong Kong.

Dorsal III–IX–8; anal I–7; head 2.57 (according to the figure); depth 3, caudal 3.5 times in the length. Snout equal to eye; interorbital space two-thirds width of eye; preorbital with two very large spines directed backward; preopercle with 4 large spines directed backward, the upper one largest; head without tubercles.

Body oblong, compressed, the snout almost straight in profile, the lower jaw slightly the longer; maxillary reaches to below posterior margin of pupil; gillrakers on lower limb 7, of small prickly clusters. First dorsal spine long and strong, directly over posterior margin of orbit, its length equal to postorbital part of head; the 3 anterior spines graduated, connected by membrane but separated from the fourth spine; anal fin rather short, its longest ray 3.5 in head; ventrals small, 2.20 in head; pectoral entire, equal to head, its rays all simple; caudal rounded, 1.2 in head.

Mottled everywhere with yellowish brown; caudal white with median transverse rows of dusky spots; pectoral with a large dusky blotch on the posterior third; other fins mottled with brown.

Two specimens from Hong Kong, .85 and 1.15 inches long. After Jordan and Seale.

These tiny fish may well be a young stage of some other scorpaenoid.

Genus APLOACTOIDES Fowler

Aploactoides Fowler, U. S. Nat. Mus. Proc. 85 (1938) 88, type *Aploactoides philippinus* Fowler.

A Philippine genus with but one known species.

Body elongate, compressed, tapers back from the rather small compressed head. Snout short, obtuse, mouth small, nearly vertical; maxillary greatly inclined, expanded behind; eye small, high, before centre of head. Teeth in villiform bands in jaws; a small band on vomer; no teeth on palatines. Preopercle and preorbital armed with several rather long spines. Gil openings wide, free from isthmus; gillrakers short, low tubercles or papillae. Skin smooth and rather loose, at least on fins. Lateral line high and close to upper edge of back. Head with short small scattered filaments. Dorsal begins over hind part of eye, first spine larger than those immediately following, the spinous fin much shorter than soft dorsal. Anal like soft dorsal, only little smaller, both fins connected behind by membrane with caudal peduncle. Caudal elongate, rounded behind. Pectoral long, reaches anal, low, base fleshy. Ventral short, fins united about opposite hind edge of eye.

Dorsal VII–15 to 18; anal II–14 or 15.

After Fowler.

Matsubara has united this genus with Erisphex, a procedure I cannot follow. *Aploactoides* does not agree with *Erisphex* as defined by Matsubara himself, and must therefore, be kept separate, at least until comparative studies are made with ample material.

APLOACTOIDES PHILIPPINUS Fowler

Aploactoides philippinus Fowler, U. S. Nat. Mus. Proc. 85 (1938) 88, *fig. 40*, off northern Mindanao.

Only known as yet from the north coast of Mindanao.

Dorsal VII–15 to 18; the first spine longest, 2.25 to 2.87 in head, the membrane notched between the first and third spines; anal II–14 or 15, the spines short, the eighth ray 1.8 to 2 in head; the last dorsal and anal rays adnate to caudal peduncle. Pectoral equal or 1.12 in head, with 14 or 15 rays; ventral I–2, its length 2 to 2.25 in head.

Depth 3 to 3.5, the head 3.66 to 3.75 in length. The snout is 3.5 to 4, the eye 5 to 5.2, in the head. Gillrakers 6 + 10, low papillae. Two strong divergent preorbital spines, posterior much longer and equal eye; 4 preopercular spines, uppermost longest, equal to eye; few short filaments on chin.

No scales, skin smooth, flabby, loosely investing fins. Many fine short cutaneous points or flaps on head. Lateral line high, extends along upper part of back, with 14 pores, and apparently reaches to base of last dorsal ray.

Brown generally, mottled or shaded little darker on head and back; fins blackish brown submarginally with edges of rays all very narrowly whitish in contrast. Small black dots, irregular and variable, scattered over trunk, tail, and fins. After Fowler.

Fowler's type, 119 mm long, was taken at a depth of 200 fathoms, off the mouth of Iligan Bay, north of Misamis, Oriental Province, Mindanao. He also had a series of paratypes, their numbers and size not given, taken in 179 to 217 fathoms.

Genus COCOTROPUS Kaup

Cocotropus Kaup, Archiv. Naturg. **24** (1858) 333, orthotype *Corythobatus echinatus* Cantor; Bleeker, Verh. Akad. Amsterdam **16** (1876) 90; Bernard, South African Mus. Ann. **21** (1927) 918; Matsubara, Sigenk. Kenky. Trans. No. 2 (1943) 465.

A genus of small obscure fishes living amid coralline algae far below low tide and therefore, very little known. Species few, in South African, East Indian, Malayan, Philippine, and Japanese waters.

Body oblong, strongly compressed, scaleless, the skin covered with prickles. The obtuse head with rough crests above or without spines. The preorbital bone with 2 blunt spines below and the preopercle with 3 or 4 obtuse or truncate spines; operculum with 2 spines. Vomerine teeth present, but none on the palatines. All fin rays simple; dorsal not divided, its origin above the eye, the first 3 spines divergent, XII or XIII–9 to 11; anal II or III–7 to 10; pectoral rounded, without free rays; ventral I–3 to 5; caudal rounded. Branchiostegals 5 or 6. No air bladder.

Key to the Philippine species of Cocotropus

A. Dorsal XII–9; anal III–8; pectoral 12 ..... *C. dermacanthus*
AA. Dorsal XIII–11; anal II–8; pectoral 14 ..... *C. obbesi*

COCOTROPUS DERMACANTHUS Bleeker

Apistus dermacanthus Bleeker, Nat. Tijds. Ned. Ind. 3 (1852) 268, Wahai, Ceram; specimen 55 mm long.

Tetraroge dermacanthus Günther, Cat. Fishes 2 (1860) 136, after Bleeker.

Aploactis dermacanthus Bleeker, Ned. Tijds. Dierk. 2 (1865) 189, Ceram.

Cocotropus dermacanthus Bleeker, Verh. Akad. Amsterdam 16 (1876) 92, *plate 5, fig. 6*, in sea at Wahai, Ceram; Bleeker, Atlas Ichth. 9 (1878) *plate 411, fig. 2*.

Coccotropus dermacanthus Weber, *Siboga* Exped. (Fische) 57 (1913) 503, North Ubian, Sulu Archipelago, Philippines, at 16–23 meters, specimen 35 mm long.

Known from the East Indies and Philippines.

Dorsal XII–9 to 11; anal III to II–7 or 8; pectoral 12. The oblong compressed body is naked, the skin and dorsal and pectoral fins more or less covered with small conical prickles, those on the cheeks, opercles, and trunk densely crowded. The depth is 3.06, the caudal 3.83, the head 2.55 times in the length. The eye is 4.5 times in the head, the interorbital breadth less than an eye diameter. The dorsal fin begins above the eye and is not divided, the 4 anterior spines divergent, the two anterior spines longest, the second spine longer than the postorbital part of the head; the anal spines are small, the third one longest.

The color when fresh is roseate gray, dotted with brown. The two specimens noted above are all that are known. Weber's specimen was taken from *Lithothamnion*, a coralline reef-forming alga.

COCCOTROPUS OBBESI M. Weber

Coccotropus obbesi M. Weber, *Siboga* Exped. 57 (1913) 503, *figs. 104–105*, North Ubian, Sulu Archipelago, Philippines, taken at 16–23 meters; specimen 49 mm long.

A Philippine species known only from the type specimen.

Dorsal XIII–11; anal II–8; pectoral 14. The depth is 3.33, the caudal 5, the head 2.72 times in the length. The eye is 4, less than the snout, which is nearly 3 in the head; the postorbital much longer, 2.2 in the head. The profile is straight, at an angle of 45°; the mouth is small, not extending to a vertical from the eye. Head with broad bony stays which are conspicuously sculptured; that on the preorbital with 3 broad blunt spines; interorbital with a pear-shaped depression surrounded by a broad comb; preopercle with 5, the opercle with 2 large blunt spines.

The dorsal begins above the middle of the eye, the second and third spines longest, the first 3 divergent. They form a sort of anterior fin, the succeeding spines at first much lower and with deeply incised membrane, then becoming higher and uniform; the dorsal rays much higher; the caudal is strongly rounded, its rays all simple. The lateral line is an open groove, with about 12 tubules. No scales, the body and fins thickly covered with spinules.

The color in alcohol is uniform gray brown, with little of the fins clear; the caudal with some small clear spots.

After Weber.

Family CARACANTHIDÆ

Body strongly compressed, suborbicular, scaleless, or covered with minute villi or tubercles. The suborbital articulated with the preopercle; small teeth on the jaws, none on the vomer and palatines. The gill openings are separated by a wide isthmus. The paired fins and pectorals are well developed, the ventrals rudimentary; the soft dorsal is longer than the spinous dorsal. Branchiostegals 5; no opening behind the fourth gill.

This family is distinguished from the Scorpaenidae by the almost orbicular form, the feeble fins, and the complete separation of the gill openings by the broad isthmus. In this last character it resembles the family of the Synanceiidae, but is strongly differentiated from that group by its entirely different physiognomy, by the size and shape of the head, and by the very different proportions of the dorsal and the paired fins.

Genus CARACANTHUS Kröyer

Caracanthus Kröyer, Naturhist. Tidsskr. 1 (1884) 267, type *C. typicus;* Bleeker, Verh. Akad. Amsterdam 16 (1876) 95; Jordan and Evermann, U. S. Fish Comm. Bull. 23, part 1 (1905) 453.

Micropus Gray, Zool. Misc. (1831) 20, type *M. maculatus;* name preoccupied; Günther, Cat. Fishes 2 (1860) 147.

Amphiprionichthys Bleeker, Ned. Tijds. Dierk. 3 (1855) 172, type *Micropus unipinna* Gray.

Centropus Kner, Stizungsber. Akad. Wiss. Wien 39 (1860) 531, type *Centropus staurophorus* Kner.

Crossoderma Guichenot, Mus. Hist. Nat. Paris Nouv. Arch. 5 (1870) 194, type *Centropus madagascariense* Guichenot.

The head and body are compressed, the head blunt, the snout short, the upper anterior profile more or less serrate from snout, or behind eye to the vertex. The preorbital and interoper-

culum with strong spines pointing downward; margin of preopercle with 3 to 5 stout spines, the opercle with 2 or 3. Dorsal continuous or more or less separated into spinous and rayed fins, VII or VIII–12 to 14, the middle spines longest; anal II–11 or 12; pectoral very wide, short, blunt, with simple rays; no pectoral filament or detached ray; ventrals rudimentary, I–2 or 3.

A genus of Indo-Pacific coral reefs, with probably 3 or 4 species; two are very widespread but only one is known thus far from the Philippines. These small feeble fishes are very poor swimmers, and live hidden under coral heads or deep within their interstices. Oddly enough, Bleeker believed they lived at great depths.

CARACANTHUS UNIPINNA Gray

Micropus unipinna Gray, Zool. Miscel. (1831) 20, Pacific Sea; Günther, Cat. Fishes 2 (1860) 147, Pacific; Günther, Fische der Südsee 1 (1875) 86, Hawaiian Islands; Tahiti; Vavau, Fiji; Pelew Islands.

Caracanthus unipinna Jordan and Evermann, U. S. Fish. Comm. Bull. 23, part 1 (1905) 454, Makemo, Taumotu Islands; Regan, Linn. Society Trans. Ser. 2 12 (1908) 237, Salomon, Chagos Archipelago, Indian Ocean; Regan Zool. Soc. London Proc. (1909) 404, Christmas Island, Indian Ocean; Fowler, Bernice P. Bishop Mus. Mem 10 (1928) 299, Palmyra and Wake Islands; Apia, Samoa; Makemo, Tuamotu Islands; Herre, Pan-Pac. Res. Inst. Jour. 8 (1933) 9, Dumaguete, Negros Oriental Prov., Philippines; Herre, Fishes 1931 Phil. Exped. (1934) 66, Dumaguete.

Amphiprionichthys unipinna Kendall and Goldsborough, Mus. Comp. Zool. Mem. 26 (1911) 316, Makemo, Tuamotu Islands.

A fish of coral reefs in the Indo-Pacific. It occurs throughout the central and southern Philippines.

Dorsal VIII–11 or 12; anal II–11; ventral I–2; pectoral 13 or 14 rays, all simple. The head is 2.5 to 2.6, the depth 1.63 to 1.86 times in the length. The eye is 4.23 to 4.78 times in the head. The suborbiculate body is strongly compressed, the dorsal outline more elevated than the ventral, deepest at the ventrals. The dorsal is continuous, with a depression or notch at the juncture of the spinous and rayed portions.

The naked body is more or less sprinkled with minute papillae; they may be very small, but are largest on the lower half of the head, usually forming a beard on the chin and preventral region; one specimen has the entire body, except a space behind the pectorals, covered with long velvety, almost fur-like papillae, which cover the pectoral base and the soft dorsal, anal, and caudal fins so that only the tips of their

rays project. There are 3 preorbital spines, the 2 anterior ones small and directed forward or downward, the much larger, broad, sharp posterior spine pointed downward. There are 5 stout rather blunt spines on the margin of the preopercle and 2 on the opercle.

The color is dusky buff, paler on the lower half of the head and abdomen; in life these parts are more or less golden.

Here described from 3 specimens, 28 and 29 mm long, taken on a reef in Bojelebung Channel, Basilan Island. My Dumaguete specimens were 26 to 34 mm long. This little fish attains a length of about 40 mm.

Family SYNANCEIIDÆ

This family, closely related to the Scorpaenidae, is between the last-named and the Triglidae. It is readily distinguished by the total absence of scales, the depressed and uncouth or monstrous form of the head, by the very long dorsal, and the broad isthmus which separates the gill openings. It is confined to the warmer waters of the Indo-Pacific. Some of the species of this family are among the most venomous of animals.

Key to the genera of Synanceiidae occurring in the Philippines and vicinity

A.—Pectoral with 1 to 3 free rays.
  B.—Pectoral with 3 free rays ..... *Choridactylus*
  BB.—Pectoral with 2 free rays ..... *Inimicus*
  BBB.—Pectoral with one free ray.
    C.—Dorsal spines elongate, weak, their tips more or less hairlike. *Decterias*
    CC.—Dorsal spines sharp, varying from strong to feeble but never hairlike ..... *Minous*
AA.—No pectoral appendage or free rays; head very large, irregular, the orbits elevated; one very long dorsal with 13 to 16 spines; anal short ..... *Synenceia*

Genus CHORIDACTYLUS Richardson

Choridactylus Richardson, Voy. *Samarang*, Fishes (1848) 8, type *Choridactylus multibarbis* Richardson; Day, Fishes India (1878) 161.
Chorismodactylus Günther, Cat. Fishes 2 (1860) 151.

Known from the coasts of China and India, and now found in Philippine waters.

The head and body are compressed, scaleless, with skinny flaps; head with bony ridges; spines on the preorbital, preopercle, and opercle; a groove on the occiput. Villiform teeth in the

jaws, none on the vomer and palatines. A single dorsal with 13 spines and 9 rays; anal with 2 spines; 3 pectoral appendages; ventral I–5. No air bladder. Branchiostegals 6; pyloric appendages few.

CHORIDACTYLUS MULTIBARBIS Richardson

Choridactylus multibarbis Richardson, Voy. *Samarang*, Fishes (1848) 8, *plate 2, figs. 1–3;* Day, Fishes India (1878) 161, *plate 39, fig. 2,* Madras, Coromandel Coast of India and China; Herre and Herald, Philip. Jour. Sci. 79 (1950) 335, *fig. 11.*

Chorismodactylus multibarbis Günther, Cat. Fishes 2 (1860) 151, China, Madras.

Long known from the coast of South China and Madras, India, and now from the Philippines.

Dorsal XIII–9; anal 11 to 8; pectoral I–6–III plus III detached rays; ventral I–5; gill rakers 2+7.

The laterally compressed body is deepest under the second and third dorsal spines, the ventral profile nearly horizontal but the dorsal profile descending steeply from the base of the third dorsal spine to the caudal base; the anterior profile broken by the very large bony eye sockets, a deep transverse groove separating them from the nape; from the eyes the snout descends almost vertically to the chin; mouth oblique, the expanded tip of the maxillary beneath the middle of the eye. Depth 2.57, head 2.84, pectoral 3, caudal and ventral each 3.375 times in the length; the longest free pectoral ray is 3.6 in the length.

The bony orbital rim with 5 blunt spines, a very deep longitudinal depression between the eyes, with a transverse ridge at its posterior end separating it from the nuchal groove. Preorbital with a strong, sharp posterior spine, ⅔ of eye diameter in length; anterior preorbital spine short, pointing downward; preopercular ridge with 2 blunt spines below the eye; hind margin of preopercle with strong, sharp spine ⅔ of the eye in length, and below it 4 more blunt and little evident spines; opercle with 2 blunt spines, the lower one concealed by the large preopercular spine; blunt postocular, nuchal, parietal, and humeral spines present.

Dorsal spines largely concealed by the thick fin membrane, which leaves only their tips exposed; first 3 spines divergent and slightly separate from the rest, the third to seventh longest, a little more than 4 times in the length or 1.46 in the head; anal spines almost entirely hidden in the skin; dorsal and anal rays short. The pectoral extends to a line from the base of the first anal ray; the ventral is adherent to the belly by a

membrane long its inner ray, and extends to a point opposite the base of the second anal spine.

The loose smooth skin is roughened on the nape and preventral region by minute warts and excrescences; numerous slender filaments and tentacles on the sides of the body, on the spinous and soft dorsal, on the pectorals, and along the margin of the opercle. Two large barbels on each side of the chin. A broad fleshy tentacle on the upper part of the eye, over its center.

The color in alcohol is brown with black spots along the lateral line; a large black spot on the second and third dorsal spines and upper part of the body beneath them; a black spot from the fifth to eight dorsal spines and adjacent dorsal region; dorsal rays black and connected by a bar with the black anal; caudal with a dusky basal band, then a broad white cross band, the posterior third of the fin black. Pectoral dull black except first ray and the 3 detached rays, which are barred with black or brown and white; inner surface of pectoral black, with 5 elongate white bands between the second and seventh rays and numerous white dots in the axilla; these dots extend beneath the black ventral and upon the ventral base.

Here described from a specimen 54 mm long, collected by a beam trawler in Manila Bay. An unexpected addition to the Philippine fish fauna. Reaches a length of about 100 mm.

Genus INIMICUS Jordan and Starks

Inimicus Jordan and Starks, U. S. Nat. Mus. Proc. 27 (1904) 158, type *Inimicus japonicus* (C. and V.); Matsubara, Sigenk. Kenky., Trans. No. 2 (1943) 414.

Fishes of the Western Pacific and Indian oceans, with 4 or 5 species ranging from Japan and China to Melanesia and Queensland, Australia, and westward to India and Mauritius.

The body is elongate, low anteriorly, with depressed and grotesquely-shaped head and greatly elevated circular bony eye sockets; skin smooth, with many dermal flaps and tentacles on the head, trunk, and fins. Mouth subvertical, with bands of teeth on jaws and vomer; palatines toothless.

Dorsal III–XIII to XV–7 to 9, the spines long and slender; the 3 anterior ones are separated from the rest, the others connected only basally by a membrane; anal II–8 to 12; pectoral large, the 2 lower rays detached but connected by a basal membrane; ventral large, I–5. No air bladder; branchiostegals 7.

Venomous fishes of uncouth shape and forbidding aspect, some largely black but others of vivid coloration. They are feared by fishermen for their severely stinging spines.

Key to the Philippine species of Inimicus

A. Uppermost pectoral ray elongate and thread-like ..... *I. bifilis*
AA. Uppermost pectoral ray not elongate and thread-like.
B. Dorsal III–XIV–8 or 9; anal II–11 or 12; cheek without groove; interorbital slightly concave, width about twice the eye.... *I. cuvieri*
BB. Dorsal III–XIII–8 or 9; anal II–10; cheek with groove; interorbital very concave, its width an eye diameter more or less. *I. didactylus*

INIMICUS BIFILIS Fowler

A Philippine species only known from the type specimen, 57 mm long, taken by the *Albatross* at Canmahala Bay, Luzon.

Inimicus bifilis Fowler, U. S. Nat. Mus. Proc. 85 (1938) 85, *fig. 38.*

Dorsal XVII–8; anal 13; pectoral I–3–VI–II; ventral I–5. The depth is 4, the head 2.75 times in the length; the snout is 2.4, the eye 5.2, the rounded caudal 1.4, the pectoral 1.5, the ventral 1.2 in the head. The narrow deeply concave interorbital is about equal to the eye. The skin is smooth, the head with many ridges, knobs, and caruncles; several flaps on the mandible. The first three dorsal spines have well developed membrane, but the rest have free tips, the membrane deeply cleft for the other spines and all dorsal rays. The uppermost pectoral ray thread-like, extending far beyond the rest of the fin and contained 1.8 times in the distance to the caudal base; ventral broadly adnate to the belly by a membrane.

Brown, paler below and with 3 pale transverse diffuse areas on body; fins more or less brownish. Dorsals and anal, head and body, with obscure pale to whitish spots and blotches, very variable. Caudal blackish on outer portion, with transverse row of small whitish spots. Pectoral with broad white subbasal band, adjoining blackish area over branched rays, and another terminally; lower detached rays with dark spots. Ventral blackish, little paler basally.

After Fowler.

INIMICUS CUVIERI Gray

Pelor cuvieri Gray, Illustr. Indian Zool. 2 (1835) *plate 90, fig. 2;* Richardson, Ichth, China, Japan (1846) 212, Canton, China; Günther, Cat. Fish. 2 (1860) 150, India, China; Bleeker, Natur. Verhand. Hollands. Maatsch. Wetenschap., Ser. 3, 2 (1874) 8, *plate 3, fig. 1,* and *plate 2, fig. 3,* Priaman, Sumatra.

Inimicus cuvieri Herre, Fishes 1940–41 Exped., Murcielagos Bay, Misamis Occidental Prov., Mindanao; Herre and Herald, Manila Bay, Luzon, near Corregidor, June, 1947.

This species is known from India, the East Indies, Philippines, and the coast of south China.

Dorsal III–XIV or XV–8 or 9; anal II–11 or 12; pectoral I–8–I plus 2 detached rays; ventral I–5, the inner ray attached to the body along its whole length; gillrakers 2+7, very short, as broad as high, their tips ending in numerous short points.

A specimen 142 mm long, or 148 mm including the lower jaw, has a plump body, laterally compressed on the posterior third, the back elevated below the fourth and fifth dorsal spines where the depth is 3.15 times in the length. From there the dorsal profile descends in a nearly straight line to the caudal base. The large broad irregularly shaped head is as wide as long, 2.84 in the length; the wide snout is twice in the head, with a large bony hump between the nostrils; the bony orbital ring is elevated, the eye small, 7 times in the head, 3.4 in the snout, and twice in the wide slightly concave interorbital; a bony transverse ridge at the rear of the interorbital space, the top of the head from dorsal origin to snout tip covered with soft smooth skin; no groove or pit below the eye. The mouth is nearly vertical, with projecting chin; the posterior end of the maxillary expanded, wider than the eye, reaching about half way to the eye.

A small blunt superior spine covered with skin, and two larger inferior ones on the preorbital; suborbital stay concealed. divided in two parts posteriorly with an anterior spine and one on each ramus, one above the other; preopercle with 4 marginal spines, the two upper strong and sharp, the lower ones short and blunt; opercle with lower divergent blunt spines; rim of the bony orbit with 3 or 4 very low blunt protuberances covered with skin and scarcely worthy of being called spines; a small rather sharp nasal spine; a nuchal and a humeral spine.

The 3 anterior dorsal spines, with membrane nearly to their tips, are divergent and nearly detached from the rest of the fin; the rest of the spines except the last with membrane incised almost to their bases so that they are nearly free; all the spines but the first and the last two are of nearly uniform height, 1.75 to 1.8 in the head; the dorsal rays except the first and last two are as high as the spines; the anal is embedded in thick skin, only the tips of the rays free; the pectoral extends

beyond the anal origin, slightly longer than the head, 2.68 in the length; the convexly rounded caudal is shorter than the head, 3.29, the ventral 3 in the length.

The body is covered with smooth loose skin, with many filaments, tentacles, flaps, and fimbriate skinny appendages, especially on the chin, mandibles, maxillaries, margins of preopercles and opercles, spines of the head, dorsal spines and rays, pectorals, and sides of the body.

The color in life is dull black or blackish brown above. In alcohol there is little change, the anterior part black, the posterior part brownish black, becoming paler with a somewhat bluish cast beneath; circular black dots on sides above anal; pectoral black with 3 rows of white spots on the inner side; dorsal black, caudal dull dusky to whitish, with 6 more or less well-defined transverse black stripes; other fins dusky or blackish.

The specimen described above was taken by trawl in Manila Bay, together with three others 104, 80, and 78 mm in length, in 18 to 23 fathoms. These smaller specimens are much slenderer than the one described, and likewise much paler in coloration. The depth varies from 3.4 to 3.85 times, the head 2.88 to 2.97 in the length. The eye is 6 in the head, 1.25 to 1.55 in the interorbital; with age, the interorbital becomes about twice the eye.

The three smaller specimens are more or less mottled with pale or nearly whitish and brown to dingy black, the head much the darkest; the specimen 104 mm long has large pale areas on the sides, which extend on the dorsal, and a wide nearly white band across the middle of caudal and pectoral; the free pectoral rays of all are banded alternately with white and dusky; ventrals black on all specimens.

Reaches a length of 172 mm.

INIMICUS DIDACTYLUS (Pallas)

Scorpaena didactylus Pallas, Specileg. Zool. 7 (1769) 26, *plate 4, figs. 1–3*, Indian Ocean.

Synanceia didactyla Bloch and Schneider, Syst. Ichth. (1801) 195.

Pelor didactylum Günther, Cat. Fishes 2 (1860) 150, New Ireland, Ceram.; Bleeker, Natuur. Verh. Holl. Maatsch. Wetensch. 3 verz. 2 (1874) 7, *plate 4, fig. 1–1a*, Singapore, Celebes, Matjan, Ceram, Amboina, Nusa Laut, Waigiu; Day, Fishes India (1878) 160, *plate 39, fig. 1*, Andaman Islands; Seale, Bernice P. Bishop Mus. Occ. Papers 4 (1906) 83, Faté, New Hebrides; Pellegrin, Mus. Hist. Nat. Paris Bull. 18 (1912) 206, New Hebrides; Borodin, Bull. Vanderbilt Marine Mus. 1 (1930) 90, Southport, Queensland, Australia.

Inimicus didactylus Fowler, Copeia, No. 58 (1918) 65, Philippines; Fowler, Acad. Nat. Sci. Phil. Proc. 79 (1927) 288, Philippines; Herre, Pan-Pac. Res. Inst. Jour. 8 (1933) 9, Dumaguete, Negros Oriental Prov., Philippines; Herre, Fishes 1931 Phil. Exped. (1934) 66, Culion; Dumaguete; Herre, 1940–41 Exped., Cagayan, Misamis Oriental Prov., Mindanao; Matsubara, sigenk. Kenky. Trans. No. 2 (1943) 418, *fig. 143*, Pelew Islands.

Pelor obscurum Cuv. and Val., Hist. Nat Poiss. 4 (1820) 320 (436), New Ireland; Lesson, Voy. *Coquille*, Zool. (1830) 211, *plate 21, fig. 2*, New Ireland.

This species ranges from the Andaman Islands and East Indies to the Philippines, Pelew Islands, Melanesia, and Queensland, Australia. It lives in the sea, in mangrove swamps, and in river mouths.

Dorsal III to XIII or XIV, 8 or 9; anal II–10; pectoral 10+2; gill rakers 3+7, very broad and short.

Depth 3.25 to 3.4, head 2.8 to 3 times in the length. Eye 6 to 7 times in the length of the head, about an eye diameter apart and about 2.5 times in the snout, which is longer than the postorbital part of the head and a little more than half the head. The width of the head equals its length; the interorbital space is deeply concave, with a transverse ridge between the two eyes, the bony orbits strongly elevated and armed with blunt spines; a deep saddle-like depression across the occiput and a groove below the eyes. The mouth is moderately large, nearly vertical, the lower jaw projecting when closed, with a symphyseal knob at its tip. Two spines on the lower edge of the preorbital and one on its upper surface; suborbital ridge spiny; occipital, parietal, and temporal ridges spiny; preopercular spines 4 or 5, the lower 2 or 3 blunt, the others sharp; opercle with 2 high divergent ridges terminating in spines.

The 3 anterior dorsal spines are strongly divergent and detached from the rest, the second one strongest, the membrane from spines 1 to 3 not incised; the remaining spines have the membrane deeply incised, more than half of their length being free. The spines of the front half of the dorsal are of nearly uniform height about .6 of the length of the head, only the first noticeably shorter; the spines of the half of the fin decrease regularly in length. The large pectoral is longer than the head, up to a third more; the free rays are shorter than the head. Caudal convexly angulate to rounded, shorter than the head; ventral nearly as long as the head and adnate to the belly, its tip reaching the anus.

Body scaleless, covered with smooth thin loose skin, with skinny flaps and tentacles scattered profusely over the body, head, dorsal, caudal, and pectorals.

In preservative the body is brown, with 3 darker brown cross bands, which extend upon the dorsal; specimens from mangrove swamps are more or less blackish. Pectoral with a basal and a distal broad dark brown cross bands, with a yellow or pale band between; the inner surface of the pectoral is dark, with a yellow or pale cross band and yellow or white spots and streaks; the outer parts of the ventral and anal are dusky or black; the caudal has 2 black cross bands.

Philippine specimens examined were 48 to 128 mm in length. Reaches a length of 173 mm.

Genus DECTERIAS Jordan and Starks

Decterias Jordan and Starks, U. S. Nat. Mus. Proc. 27 (1904) 154, type *Decterias pusillus* (Schlegel).

This genus is separated from its nearest relative, *Minous,* mainly by the character of its dorsal spines. These are not only slender and flexible, but become elongate and more or less hair-like, in marked contrast to the hard sharp spines of most scorpaenid fishes. Fin rays all simple. Dorsal spines 10 or 11, mostly 11; soft dorsal rays 9 to 12, mostly 10; anal II–7 to 9; teeth on the vomer but not on the palatines; skin smooth, naked. Interorbital space narrow and deeply concave; preorbital spines short. The head disproportionately large and rough.

The single species known occurs from Japan to the Philippines.

DECTERIAS PUSILLUS Schlegel

Minous pusillus Schlegel, Fauna Japonica Poiss. (1842) 50, Nagasaki, Japan; Günther, Cat. Fishes 2 (1860) 149, after Schlegel; Steindachner and Döderlein, Fische Japans, Part III (1884) 297, Kagoshima, Japan; Matsubara, Sigenk. Kenky. Trans. No. 2 (1943) 409, *figs. 140–141,* Miya, Aiti Prefecture; Wakanoura; Nagasaki; Kagosima, Japan; Panay, Philippines.

Decterias pusillus Jordan and Starks, U. S. Nat. Mus. Proc. 27 (1904) 154, *fig. 15,* Wakanoura; Jordan and Seale, U. S. Bur. Fish. Bull. 26 (1907) 38, Panay, Philippines.

A Japanese species ranging south to the Philippines.

Dorsal IX to X or XI–9, 10, or 11; anal II–7 to 9, mostly 8; pectoral 12; pores in lateral line 14 to 18; gillrakers on lower limb 8 or 9, short and blunt.

Eye 2.72 to 2.98 times in the head in males, 3.11 to 3.76 in females. Upper profile of head very much broken up, the

superior postorbital region much produced; a deep notch in front of orbital rim caused by the produced nasal region. Upper part of eyeball with a series of 4 large dermal cirri, extending beyond the orbital rim. Exposed bones of head very rough, the orbital rim denticulate; 2 or 3 irregular denticulate ridges along the suborbital. Preorbital with 2 short spines, the anterior directed downward, the posterior one backward and downward, but never reaching the hind margin of the maxillary; preopercle with a long sharp spine, which does not reach the posterior margin of the opercle, and 4 smaller ones below. Parietals very rough and produced behind in spines, a rough ridge running backward from the hind margin of the eye. Interorbital narrow, deeply concave, its width .6 of the eye. Mouth large, maxillary reaching below anterior part of eye. Vomerine teeth in 2 small widely separated patches.

Dorsal not notched, the spines with elongate hair-like tips extending far beyond the fin membrane; third to sixth dorsal spines longest, equal to snout and half the eye; caudal rounded, 2 in head; pectoral extending to or beyond the anal origin, equal to or nearly equal to the head; the detached pectoral ray shorter, reaching to tip of ventral; ventral reaching anus, about half the inner ray adnate to the body. Middle of mandible with a rather long barbel, and many small cirri on anterior half of lower jaw; a barbel between the lowest preopercular spine and the posterior edge of the maxillary.

Preserved specimens are mottled slaty or dark brown above, the lower half abruptly white, spinous dorsal membrane usually black, the soft dorsal with several irregular dark brown or dusky transverse lines or bars; caudal with 5 or 6 irregular cross rows of dark spots; pectoral black on its outer face, the inner side black or tinged with white, but never all or conspicuously white; ventrals and anal blackish distally, shading basally into the white of the under side of the body.

The only specimen at hand is one 38 mm long from Barrio Wawa, Nasugbu, Batangas Province, Luzon. Other Philippine specimens previously examined were from Manila Bay, and Iloilo, Panay, and were compared with Japanese material.

This is a small species, maturing at 45 mm and upward. Apparently it does not exceed 60 mm standard length.

Genus MINOUS Cuv. and Val.

Minous Cuv. and Val., Hist. Nat. Poiss. 4 (1829) 420; type Minous *woora* Cuv. and Val.; Günther, Cat. Fishes 2 (1860) 148; Barnard, South African Museum Ann. 21 (1927) 920.

Small Indo-Pacific fishes occurring from India to Japan.

Body oblong and moderately compressed, without scales; head large, rough, the bones ridged and rough, with spines on the preorbital and opercle, and 4 or 5 on the preopercle. Villiform teeth in jaws and on vomer; none on palatines. Cirri on the upper part of the eyeball and on the lower jaw. Fin rays all simple; dorsal continuous, with 8 to 12 spines and 9 to 14 rays; anal II–7 to 11; pectoral 11 to 13, moderate to long, the lower ray free; ventral I–5; caudal rounded to truncate. Air bladder present or absent. Pyloric appendages 3 to 5. Branchiostegals 7.

The dorsal spines vary from weak to strong, but are always sharp and too firm to be flexible. The dorsal spines of *Dectenias* are very slender, hair-like and weak.

Key to the Philippine species of Minous

A.—Dorsal spines slender, feeble, more or less flexible but not hair-like; no air bladder; 5 or 6 cirri on eyeball ..... *Minous inermis*

AA.—Dorsal spines strong, sharp; air bladder present; 2 to 4 cirri on the eyeball ..... *Minous trachycephalus*

MINOUS INERMIS Alcock

Minous inermis Alcock, Asiat. Soc. Bengal. Jour. 58 (1889) 299, *plate, 22, fig. 4*, Bay of Bengal; Alcock, Ann. Mag. Nat. Hist., Ser. 6, 10 (1892) 207, Bay of Bengal; Alcock, Asiat. Soc. Bengal Jour. 63 (1894) 116, Alcock and McGilchrist; Illustr. Zool. *"Investigator"* Part 2 (1895) *plate XVIII, fig. 3;* Goode and Bean, Oceanic Ichthy. (1895) 524, Bay of Bengal; Alcock, Cat. Deep Sea Fishes coll. by the *"Investigator"* (1899) 30, off Caromandel Coast, off Malabar Coast; Franz and Stechow, Zool. Anzeiger 32 (1908) 753; Matsubara, Sigenk. Kenky. Trans. No. 2 (1943) 406, *fig. 193*, Kumano–Nada, and Nagasaki, Japan.

Occurs from the coasts of India to the Philippines and Japan.

Dorsal VIII to X–12 to 14, mostly IX–13, according to Matsubara, but my specimens have the dorsal XI–10 to 12; anal II–9 to 11 (Matsubara), but my material II–9; pectoral 11+1; gillrakers 3+10; Matsubara gives 11 to 17.

Depth 2.77 to 3, caudal 3.16 to 3.33, head twice to 2.5 in the length. The body is laterally compressed, in older specimens the back arched, the head large, rough, with numerous strong ridges, the orbital ridges prominent, the snout with a central hump. The snout equals the eye, which is 3 to 3.28 in the head, and greater than the interorbital which is 1.5 to twice in the eye. The upper part of the eyeball bears 5 or 6 dermal

cirri, the central ones large and more or less fringed, the longest reaching the upper rim of the eye socket; the snout and preorbital with minute blunt spines, and other bones with minute tubercles; two preorbital spines, the anterior directed downward at right angles, the posterior one larger to twice as large and directed backward but never extending more than half way to the posterior edge of the maxillary; mouth moderately inclined, rather large, the posterior end of the maxillary beneath the front part or middle of the eye. Small barbels on the chin and under side of the mandible.

The wide rough serrulate suborbital stay divides posteriorly into 4 or 5 ridges; 5 or 6 preopercular spines, the 3 lower ones broad and blunt, the upper one sharp, strong, and largest but not extending to the opercular margin.

The three anterior dorsal spines are widely divergent, the membrane incised to or nearly to their bases, the first spine very short, the second spine 2 or 3 times as long and subequal with the remaining spines.

The pectoral reaches to a point above the base of the third to sixth anal ray, 2.33 to 2.7 in the length; the ventral extends to the base of the second anal spine, 3 to 3.45 in the length.

The color is brown or mottled above and on the sides, where it becomes paler to white beneath; some specimens are mottled as in Matsubara's fig. 138 of *Minous monodactylus*. The pectorals are brown to black, the free ray paler, sometimes with one or two partial white cross bars; ventrals dusky or black, especially distally; dorsals and anal more or less dusky to blackish, especially marginally; caudal brownish or pale with a dusky or black tip.

Here described from ten specimens taken by beam trawl in Manila Bay, Luzon, in 17 to 25 fathoms. Their lengths are from 33 to 58 mm.

These specimens do not agree with *M. inermis* as given by Matsubara, and at first I called them *M. pusillus*. Through the kindness of Dr. Geo. S. Myers and Dr. Margaret Storey, of the Standford University Natural History Museum, two specimens of *Decterias pusillus* from Japan were obtained on loan. It needed but one glance at them to show that the Manila Bay specimens could not be *D. pusillus*. They are intermediate between *Minous inermis* and *Decterias pusillus* of Matsubara, but they are placed in *M. inermis* in preference to calling them new.

This fish reaches a length of 116.8 mm.

MINOUS TRACHYCEPHALUS (Bleeker)

Aploactis trachycephalus Bleeker, Nat. Tijds. Ned. Ind. 7 (1854) 451, Manado, Celebes.

Minous trachycephalus Günther, Cat. Fishes 2 (1860) 149, after Bleeker; Bleeker, Verh. Akad. Amsterdam 16 (1876) 62, *plate 2, fig. 3*, Manado, Celebes; Amboina; Nias; Bleeker, Atlas Ichthy. 9 (1878) *plate 415, fig. 4;* Fowler, U. S. Nat. Mus. Proc. 62 (1922) 63, Takao, Formosa; Herre, Philip. Jour. Sci. 59 (1936) 367, Subic Bay, Zambales Prov., Luzon; Matsubara, Śigenk. Kenky. Trans. No. 2 (1943) 405, Tonkin Bay; Herre, 1948 Collection, Manila Bay, Luzon.

East Indies, Philippines, Indo-China.

Dorsal X to XI–9 to 10; anal II–7 or 8; pectoral 11+1, gill rakers 3+7; air bladder present.

The depth of the oblong compressed body is 3 to 3.14, the head about 2.4 times in the length; the eye is 4 to 4.25, the snout about 2.5 in the head; the interorbital is half or two-thirds an eye diameter; on the upper part of the eyeball are 2 to 4 cirri, their length less than eye diameter. Bones of the head very rough and ridged.

The preorbital has 2 spines, the upper one directed backward and fanglike, more than twice as large as the other, extending to the posterior margin of the maxillary but not equal to the eye. The mouth is oblique, the lower jaw prominent, the maxillary extending to beneath the front margin of the eye but scarcely reaching a line from the front of the pupil; several short simple cirri under the tip of the lower jaw, a larger one about the middle of the mandible, and a similar one beyond the posterior end of the maxillary. Five preopercular spines, the lower ones short and blunt, the uppermost one strong, sharp, and extending to the margin of the opercle.

The 3 anterior dorsal spines strongly divergent, with deeply incised membrane, only the lower third united. The first dorsal spine is much less than the eye, the others subequal and a little longer than the eye; the soft dorsal rays, except the last 3, higher than the spines and equaled only by the median anal rays. The pectoral reaches above the origin of the fourth to sixth anal ray, and is shorter than the head. The caudal is nearly truncate and equals the head without the snout; the ventral extends to the anal origin.

Color olive brown or darker on the back and sides, fading to pearly or nearly white beneath, with dusky mottlings on the sides. The dorsal rays with 2 or 3 oblique dark bands; the pectorals, ventrals, and anal blackish on their outer half; the

free pectoral ray with white and dusky rings; the caudal clear, with rows of spots on the rays.

Description compiled, as no specimens are available at this time.

My Philippine specimens were 53 and 41 mm in length. Bleeker had 8 specimens, 49 to 80 mm in length. Fowler had one specimen of 60 mm, and Matsubara one 93.6 mm long.

Genus SYNANCEIA Bloch and Schneider

Synanceia Bloch and Schneider, Syst. Ichth. (1801) 194, type *Scorpaena horrida* L.; Cuv. and Val. Hist. Nat. Poiss. 4 (1829) 440; Günther, Cat. Fishes 2 (1860) 146; Bleeker, Naturk. Verhand. Hollands. Maatsch. Wetenschap., Ser. 3, 2 (1874) 10.
Synanceja Jordan and Seale, U. S. Bur. Fish. Bull. 25 (1906) 379.
Synancidium Muller, Wiegmann's Archiv. Naturges. (1843) 302.

Lump fish; Poison fish; Lupo. The species of this genus are the largest and most dangerous of the venomous fishes. Tropical Indo-Pacific.

Dorsal XII–XIII–6 or 7; anal III–6; pectoral broad, with 15 to 17 divided rays, and no free rays; ventral I–5, entirely adnate.

Body oblong, its width anteriorly about equal to its depth, compressed posteriorly, scaleless, the skin of the head, body, and fins covered with warty tubercles, and also with skinny flaps and tentacles; head irregular, large, the mouth vertical or nearly so; villiform teeth on the jaws; vomerine teeth present or absent; no palatine teeth; spinous dorsal enveloped in thick skin, only the tips of the strong sharp spines projecting, each spine with 2 venom glands. Soft dorsal continuous with, and much shorter than, the spinous dorsal. A deep subocular pit; a small air bladder present, pyloric appendages few; branchiostegals 7.

The venom of these fishes is exceedingly virulent, causing intense agony. A shot from most of the dorsal spines usually brings death in one to four hours, and always means horrible pain. Gangrene often develops from wounds by these fishes, causing the loss of a hand or foot in many instances where the sufferer does not die from the injury.

The lump fishes are found not only on coral reefs, but also frequent shallow and more or less rocky and muddy harbors and estuaries. I have taken them in Jolo harbor and elsewhere in waters not more than half a meter deep. One must keep a vigilant watch for the Lupo when wading in Philippine waters. The Lupo fears nothing and ordinarily will not re-

treat. One must learn to recognize the lump fishes by their shape and distinguish them from rocks on the reef or sea floor. He must also refrain from putting his hands into crevices or into holes or under ledges. The Sulu Islanders have the wisdom to carry a light spear when wading on the reef, and we do well when we follow their example.

The lump fishes attain a weight of one to two kilos, though such large ones are seldom seen, as they stay in deeper water. They are sometimes taken by the commercial fishermen, and occasionally are seen in the markets. They are good edible fish, with white flaky flesh. The spines and their poison glands are removed by a slash with a bolo, and the fish are then safe to eat.

Key to the Philippine species of Synanceia

A.—Teeth on the vomer (rarely absent); orbits conspicuously elevated; no deep groove or ridges on the interorbital; a deep saddle-shaped occipital groove; suborbital pit deep, more than twice as wide as eye ..... *S. horrida*

AA.—No vomerine teeth; orbits little elevated; interorbital deeply concave, without ridges; occipital depression very shallow; suborbital pit less than twice the width of the eye ..... *S. verrucosa*

SYNANCEIA HORRIDA L.

Scorpaena horrida Linnaeus, Syst. Nat., ed. 12, (1766) 453, East Indies; Bloch. Ausland. Fische (1789) *plate 183;* Lacépède, Hist. Nat. Poiss. 2 (1802) *plate 17, fig. 2;* 3 (1803) 261.

Synancidium horridum Müller, Abh. Akad. Wiss., Berlin (1844) 163; Günther, Cat. Fishes 2 (1860) 144, Australia, China, India; Kner Reise *Novara,* Zool. (Fische) (1868) 119; Seale and Bean, U. S. Nat. Mus. Proc. 33 (1907) 248, Zamboanga, Zamboanga Prov., Mindanao; Fowler, Bernice P. Bishop Mus. Mem. 10 (1928) 297.

Synanceia horrida Bloch and Schneider, Syst. Ichth. (1801) 194; Cuv. and Val., Hist. Nat. Poiss. 4 (1829) 323; Bleeker, Naturk. Vorhand Holland. Maatsch. Wetensch., Ser. 3 2 (1874) 12, Sumatra, Singapore, Bintang, Banka, Billiton, Java, Celebes, Ternate, Buru, Ceram, Amboina; Herre, Bur. Sci. Coll., 1920–28, Puerto Galera, Mindoro; Bantayan Island; Gulf of Davao and Zamboanga, Mindanao; Jolo, Sulu Province; Herre, Fishery Resources Philippine Islands (1927) *plate 39;* Herre, Pan-Pac. Research Inst. Jour. 8 (1933) 9, Dumaguete, Negros Oriental Prov., Philippines; Herre, Fishes 1931 Philip. Exped. (1934) 66, Culion, Dumaguete; Herre, Fishes 1936–37 and 1940–41 Expeditions, Ragay Gulf, Luzon, and Sitankai, Sulu Prov., Philippines.

Gatasan; Sumalapao. Found in the waters of the East Indies, Philippines, China, India, and Australia.

Dorsal XIII–6, rarely XII–6; anal III–6; pectoral I–14 to I–16.

Depth 2.4 to 2.5, head 2.15 to 2.25, pectoral 2.66 to 2.75, caudal 4.75 to 5.4 times in the length.

The bony orbit is produced in a conical peak projecting high above the eye, which is 7 to 9 times in the head and about 2.6 in the snout; interorbital twice or more than twice an eye diameter; postocular pit deep, saddle-shaped; suborbital pit deep and wide, more than twice the eye; vomerine teeth commonly in a short semilunar band.

Preorbital with 2 obtuse to acute, divergent subequal spines on its lower margin; preopercle with 4 or 5 marginal spines, the upper one much longer than the others, which are short and obtuse; opercle with 2 blunt divergent spines; a strong humeral spine.

Skin soon roughened with tubercles and warts, which extend on the entire dorsal, on the pectoral, and on the anal base. Lower jaw, preopercular spines, and elsewhere on the head with skinny flaps and appendages, often very wide and fimbriate. First 3 dorsal spines widely divergent, the membrane between the first 4 spines deeply incised, the upper half of the first 3 spines free, the remaining spines largely concealed by skin, their height (except the first) nearly uniform, 3.15 in the head;

Dorsal rays a little higher, 2.6 in the head; anal rays little different. Pectoral reaches to the first to third anal spine.

Color of body and fins dusky, deep dull brown or rosy brown; pectoral and caudal with numerous transverse pearly stripes; dorsal and anal with many pearly diagonal stripes.

Well and unfavorably known to Filipino fishermen, who are not at all averse to eating it after removing the poison glands.

Attains a length of over 300 mm, and a weight of at least 2 kilos.

SYNANCEIA VERRUCOSA Bl. and Schn.

Synanceia verrucosa Bloch and Schneider, Syst. Ichth. (1801) 195, *plate 45*, India; Cuvier, Règne Animal, ed. 1 2 (1817) 286; Rüppell, Neue Wirbelt., Fische (1835) 109, Red Sea; Günther, Cat. Fishes 2 (1860) 146, Mauritius; Klunzinger, Verhandl. zool-bot. Gesells. Wien 20 (1870) 811, Red Sea; Bleeker, Natuurk. Verhand. Hollands. Maatsch. Wetenschap., Ser. 3, 2 (1874) 15, *plate 2, fig. 2*, Batu, Cocos, Bintang, Celebes, Timor, Halmahera, Ceram, Amboina, Banda Neira, Waigiu, New Guinea; Günther, Fische der Südsee 1 (1875) 84, *text figure*, Society Islands; Day, Fishes India, (1878) 162, *plate 39, fig. 4;* Seale, Bernice P. Bishop Mus. Occ. Papers 4 (1906) 81, Tubuai, Austral Islands; Kendall and Goldsborough, Mus. Comp. Zool. Mem. 26 (1911) 316, Jaluit, Marshall Islands; Herre, Pan-Pac. Research Inst. Jour. 8 (1933)

9, Dumaguete, Negros Oriental Prov.; Herre, Fishes 1931 Philip. Exped. (1934) 66, Atimonan Tayabas Prov., Luzon; Dumaguete; Bilatan Island and Sitankai, Sulu Prov., Philippines; Herre, Raffles Mus. Bull. No. 13 (1937) 34, Singapore.

Synanceja verrucosa Jordan and Seale, U. S. Bur. Fish. Bull. 25 (1906) 379, Apia, Samoa; Jordan and Dickerson, U. S. Nat. Mus. Proc. 34 (1908) 616, Suva, Fiji; Snyder, U. S. Nat. Mus. Proc. 42 (1912) 512, Okinawa; Nichols, Amer. Mus. Novit. No. 94 (1923) 3, Mangareva; Fowler, Bernice P. Bishop Mus. Mem. 10 (1928) 297, New Guinea, Guam; Jaluit; Marshall Islands; Tubuai, Austral Islands; Caroline Islands; Ebon Island; Tuamotus; Matsubara, Sigenk, Kenky. Trans. No. 2 (1943) 425, *plate 4*, Miyakozima, Okinawa, Riukiu Islands; Pelew Islands.

Synancia verrucosa Günther, Cruise of *Curacoa* (1873) 409, Solomons; Peters, Monatsber. Akad. Wiss. Berlin (1877) 834, New Hannover; Boulenger, Ann. Mag. Nat. Hist. London, 6th ser., 20 (1897) 373, Rotuma; Garman, Mus. Comp. Zool. Bull. 39 (1903) 232, Fiji.

Scorpaena brachio Lacépède, Hist. Nat. Poiss. 3 (1802) 259–272, *plate 12, fig. 1.*

Synanceia brachio Cuv. and Val., Hist. Nat. Poiss. 4 (1829) 328 (447), Mauritius; Waigiu; Kusaie; Bora Bora; Cuvier, Règne. Animal, Disciples Ed., Poiss. (1836) *plate 25, fig. 3.*

Scorpaena brachiata Shaw, Gen. Zool. 4 (1803) 274.

Synanceia thersites Seale, Bernice P. Bishop Mus. Occ. Papers 1 (1901) 121, Guam, Marianas.

Found all over the tropical Indo-Pacific, from the Red Sea to the East Indies, Philippines, Marshall, Fiji, Samoan, Society, and Tuamotu Islands, and Australia.

Dorsal XIII–6 or 7; anal III–5 or 6; pectoral I–17 or 18; gillrakers 3 to 5 + 4 or 5.

Depth 2 to 2.3, head 2.2 to 2.55, the caudal 4.5 to 5.4 times in the length; the longest pectoral rays equal the head. The eye is 6 to 8, the snout 3.65, the interorbital 3.2 to 3.4, the maxillary 2 to 2.4 times in the head. The interorbital space is deeply concave, without transverse ridges; the eyes are only slightly elevated; the pit beneath the eye is deep, less than twice as wide as the eye. No vomerine teeth. Preorbital with 2 blunt diverging spines on its lower margin; suborbital stay without spines; preopercular spines 2, blunt, very small, and hidden under the skin; 2 blunt divergent opercular spines; humeral spine blunt.

Body scaleless, skin thick, covering the fins almost entirely, with tubercles, warts, many filaments, cirri, and skinny flaps on head, body, and fins. Dorsal beginning above the opercle, the first 2 spines strongly divergent, those following commonly shorter, all spines very strong and sharp; longest dorsal spine

1.9 to 3 in head, usually 2.25 to 2.75 and a little shorter than the first 4 or 5 dorsal rays; third anal spine largest, 2.9 to 3.9 in the head; fourth anal ray longest, 1.66 to 2.4 in head; the convex caudal is 1.5 to 2 times in the head, the ventral 1.15 to 1.3. The pectoral extends to or upon the anal.

The color is highly variable; often they are gray, like coral sand spotted with mud, with spots of orange or yellow which show only when the fish moves; caudal with a dusky cross band, preceded and followed by whitish cross bands. Others are more or less dusky, resembling the rocky muddy bottom, but marbled with purplish or rose on the body and fins. All the fins marginal with rose or purple, becoming white in preservative. Pectoral with numerous white transverse stripes. Caudal usually with a broad dark brown basal band, then a broad white band, followed by a wide dusky band. Many preserved specimens have white blotches on the body, but those like gray coral sand change very little in alcohol.

Reaches a length of 330 mm and a weight of about 2 kilos.

BOOKS

Books reviewed here are received from time to time by The Philippine Journal of Science and acknowledged in this section.

Chemical Kinetics. By Keith J. Laidler. 1st ed. New York, McGraw-Hill Book Company, Inc., 1950. 408p. Price $6.00.

As far back as 1812 some experiments have been undertaken on the rate of decomposition of certain chemical substances. It is only quite recently, however, that attempts were made to correlate the phenomena involved with kinetic laws. This book on Chemical Kinetics is comparatively recent. It deals with the subject of chemical reaction as a function of time.

Chapter 1 is a discussion of the rates of chemical reactions, for first and second order, and reaction falling under first-order and second-order kinetics. The discussion is supplemented with mathematical equations, illustrated with concentration-time curves on specific cases. Chapter 2 is a series of descriptions of the experiments performed in connection with the studies of reaction kinetics with illustrations of the apparatus used in every case.

Chapters 3, 4, 5, and 6 are devoted largely to the special features of reactions occurring in the gas phase, in solution, on surfaces and in the solid state. In these chapters, Arrhenius law and van't Hoff's theory on equilibrium constant expressed in terms of concentration and Burk's multiple adsorption and Balandin's "multiple hypothesis" on adsorption, are discussed.

Chapter 7 deals with complex reactions in general. Complex reactions that take place in a number of well defined steps and the various methods for the estimation of intermediate products are given. Chapters 8 and 9 deal with the mechanisms of complex inorganic and organic processes respectively, giving specific instances of photochemical and thermal reactions of inorganic constituents and the observation that many of the complex organic reactions obey simple kinetic laws.

Chapter 10 describes the different conditions under which catalytic processes take place, such as catalysts combining with substrates and the mechanisms of acid-base catalysts and catalysis by enzymes. Chapters 11 and 12 deal with oxidation and polymerization respectively. The former describes the conditions under which explosion may occur as a result of oxida-

tion. The latter gives mathematical equations to explain the mechanisms of two types of polymerization, namely, condensation polymers and addition polymers.

Chapter 13, on potential-energy surfaces, is the last chapter containing conclusions are arrived at, on the basis of the discussions on theoretical and experimental work. The discussion is mainly concerned with elementary reactions. Certain processes involving a change of one type of energy into another which are not strictly chemical processes are also described, such as, transfers of vibrational, rotational, electronic energy, etc.

At the end of every chapter a series of problems are given covering the main points discussed in the chapters. The solutions of these problems lead to a sound understanding of the principles of chemical kinetics.—R. H. A.

Principles of Genetics. By Edmund W. Sinnott, L. D. Dunn and Th. Dobzhansky. 4th ed. New York, McGraw-Hill Book Company, Inc., 1950. 505p. illus. Price $5.00.

The chief modifications of the old editions embodied in this new text are found in Chapters VII to X. They deal with the physical basis of heredity in the chromosomes which may be explained as follows:

All life may be viewed as depending on a mutual interaction of heredity (the behavior of chromosomes) and environment. The behavior of chromosomes at meiosis divisions provides the mechanism for segregation and independent assortment of genes as Mendel's phenomena inferring the existence of genes in the chromosomes.

The extensive study of the linkage maps of inheritance in which the genes or factors tend to remain together during the normal process of segregation, made by Morgan in 1910, indicated that the tendency of linked genes is to remain in their original combinations. This was due to the residence of these genes in the same chromosomes. The strength or degree of linkage depends upon the distance between the linked genes in the chromosomes. The development of this most acceptable theory propelled the latest scientific linear arrangement of genes in the chromosomes and has served as a background for the construction of genetical or linkage maps of chromosomes.

The chromosome aberrations and cytological maps of chromosomes are beautifully illustrated in Bride's maps of the chromosomes using the salivary gland cells of *Drosophila melanogaster* and in Dobzhansky's comparison of genetical and

cytological maps of the third, second and tenth chromosomes of the same respectively. In the chromosome aberrations, changes in chromosome number or structure can be grouped into two types; one involves the number of the chromosomes, and the other alters the number or arrangement of genes in the chromosomes. The work on cytological maps of the chromosomes confirmed the theory of linear arrangement of genes in the chromosomes as a result of studies on recombination of traits in crosses or hybrids.

In this new edition, the breeding structures of natural populations of both plants and animals and of human populations are expanded in the field or genetics and are found in Chapter XII to XIV. They deal principally with the genetics of population based on the Hardy-Weinberg law of 1908 on genetics of race and species formations.

Population genetics involves the heredity of population as a whole rather than as individuals. That is, homogamic mating or inbreeding leads to more homozygotes and less heterozygotes. Conversely, heterogamic mating or outbreeding, which is preferred of the two, increases the frequency of heterozygotes. It has been observed that neither homogamy nor heterogamy changes the gene frequencies in the gene pool chromosome, but each when allowed to perpetuate, only increases their combinations. Both will reach their maximum variation or uniformity as the case may be. Outbreeding is more beneficial in the production of superior strains.

Genetics of race formation emphasizes the fact that races are units which describe neither individuals or arbitrarily chosen groups of individuals, but populations, that is, communities breeding true-to-type, the members of which share in a common gene pool, hence, it is a concept bearing evidences on the theory of race formation.

Genetics of species formation caused by geographical isolation permits races not only to maintain their distinctiveness as populations, but also to accumulate more and more genetic differences. Their preferences for different soils, or different amounts of moisture, or association with different hosts or food sources caused the different species to live in geographical isolated regions. Such ecological distinction may be accounted for as follows: (1) Little or no opportunity for members of isolated populations to meet or hybridize, hence, they maintain homogenousity both in their genotypic and phenotypic characters; (2) Species reaching sexual maturity or flowering times

at different seasons of the year, which are called seasonally isolated, have no chance to produce through artificial hybridization; and (3) Hybrids produced between species whose gene exchange between the populations of these species fail to occur so that such hybrids become sterile like the two species of flax, *Linum austriacum* and *L. perene* which crossed, but the hybrid seeds do not germinate and the mule, a sterile hybrid between a horse and an ass.

Genetic differences of isolated species may be produced, however, through introgressive hybridization (Anderson) which means the introduction of some genes of one species into the genotype of another species. For example, the hybridization of maize with a different grass, *Tripsacum* sp., resulted in the production on one hand the Teosinte, *Euchlaena mexicana* (grass in Mexico and Guatemala), and on the other the modern varieties of corn or maize now in cultivation.

This new text contains an appendix showing the translation made by the Royal Horticulture Society of London about experiments in plant-hybridization. It includes the translation of the original report of Mendel in 1865 when modern genetics began. Sterling Professor Sinnot states that students of genetics should be familiar with this paper which still forms the best introduction to the basic evidence and the principles derived from it.—T. G. G.

Internal Ballistics of Solid—Fuel Rockets. By R. N. Wimpress. 1st ed. New York, McGraw-Hill Book Company, Inc., 1950. 214p. Price $4.50.

This book is a record of the results and observations obtained by several groups commissioned by the U. S. Government to undertake research work in rockets during World War II. It presents a characteristic study of rockets using the dry-processed-double-base propellants as fuel. The characteristics of propellant gases, such as the equilibrium constants for the principal gas-phase reactions and the enthalpy and entropy of the reaction products, are discussed. Some of the propellants studied are the JP ballistite, JPN ballistite and the Russian cordite. The author discussed in a concise form the factors and conditions which affect the characteristics of this type of rocket, such as the effect of pressure on the burning rate, nozzle performance, shape of propellant grain and its desirable properties. A chapter is devoted to heat transfer to emphasize its importance in rocket design.

This book will be of great benefit to those working on rocket design because of the valuable information and experimental data presented.—J. P. P.

Quantitative Analysis. By William Rieman, Jacob D. Neuss and Barnet Naiman. 3rd ed. New York, McGraw-Hill Book Company, Inc., 1951. 523p. Price $5.00.

In this book the modern method of analysis and a more detailed discussion of the fundamental principles of chemistry are given. The reader will recall his knowledge in general chemistry, quantitative chemistry and simple mathematics.

Potentiometer and potentiometric titrations are also covered. The pH of water, weak acids, strong alkali and acids are determined by the use of potentiometers and the principles involved are well-explained. The titrations without indicator for silver nitrate with sodium chloride indicates the usefulness and accuracy of potentiometric titrations.

This book is good as a text for students in quantitative analysis, metallurgy, and engineering. It is a good reference for students, professors, and professional analysts.—R. R. O.

Basic Thermodynamics. By Charles Leonard Brown. 1st ed. New York, McGraw-Hill Book Company, Inc., 1951. 266p. $4.50.

This book is intended for students who have had previous courses in elementary heat power. Because of this, there is little descriptive material in the text. It emphasizes fundamental laws of thermodynamics and their application to analyses of the performance, design and limitations of heat engines and allied machinery. Subjects covered are limited to those that could possibly be discussed in a semester's period. Subject matter begins with the first and second laws of thermodynamics and so on with properties of media and processes, machines for carrying on the processes, then the arrangement to generate work from heat. A short chapter on heat transmission completes the discussion of the utilization of heat. There is a tendency to eliminate special formulas and to put numerical examples simply as variants of a general case.

The book is supplied with necessary tables and charts.

The author is an Assistant Professor of Mechanical Engineering at Purdue University.—M. F.

Introductory Chemistry. By L. H. Meyer. The Macmillan Co., Inc., New York, 1951. 532p., illus. Price $5.00.

This book is an introductory course in General Chemistry. While it is intended primarily for freshmen students of home economics and the biological sciences, it should also be a useful textbook for other students who do not intend to take up chemistry as their major subject.

The first part of the book contains materials usually covered in an introductory course in Chemistry, such as: (1) a short history of chemistry and its development, (2) oxygen, (3) hydrogen, (4) gases, liquids and solids, (5) atomic theory, (6) acids, bases, and salts (7) the periodic table, (8) water and its uses (9) solutions and ionization (10) the colloidal state (11) quantitative solutions (12) oxidation and reduction reactions (13) the metals and non-metals. The second part of the book is devoted to the study of organic chemistry, biochemistry and textile chemistry. Some chapters are also included to stimulate students interest, such as the chapter on glass and pottery.

The method of presentation is very clear and the book contains plenty of illustrations which create interests in the study of Chemistry. The illustrations covered are up-to-date and the book, as a whole, should prove to be an easy and understandable reading matter for those who desire to keep abreast of some of the recent developments in chemistry.—E. P. R.

The Physics of Powder Metallurgy. Edited by Walter E. Kingston. 1st ed. New York, McGraw-Hill Book Company, Inc., 1951. 404p. Price $8.50.

"The Physics of Powder Metallurgy" is a highly technical and theoretical subject involving higher mathematics. This type of book is good for technically minded people. It is a good reference for researchers in physics, physical chemistry and metallurgy.

Metallurgists will find in this book, sintering of mixtures of two or more metals. They might be interested in the reaction of the sintered materials at low and high temperatures, the phase system formed, as well as the chemical and physical properties of the sintered materials. They might also be interested in the properties of sintered alloys, physical as well as chemical.

This book is highly recommended for researchers, professors and metallurgists.—R. R. O.

The Effects of Atomic Weapons. Prepared by the United States Atomic Energy Commission and Department of Defense. New York, McGraw-Hill Book Company, Inc. 1950. 456p. Price $3.00.

The book consists of twelve chapters and six appendices. It is a technical description of the enormous amount of energy released from the explosion of an atomic bomb and the disastrous effect of such explosion on human lives and property.

For a better understanding of the subject, the phenomenon of radioactivity and the underlying principles involved in the release of destructive elements are explained and illustrated in the first chapter. In the succeeding chapters efforts were made to evaluate the intensity of atomic explosions in the air, underground and underwater based on the studies and observations undertaken by atomic energy specialists at Alamogordo, Bikini, Nagasaki and Hiroshima.

In chapters IX and X the instruments used for the measurement of nuclear radiation and the methods and procedure adopted to safeguard people from radioactive contamination are described. Protection of food and removal of radioactivity from water supplies are also explained.

In chapters XI and XII the types of injuries caused by direct or indirect blast, flames, and flash, nuclear radiation, etc., on different parts of human body, external and internal are discussed. Due consideration is also given to the problem of protecting the personnel from the disastrous effects of atomic bomb and to the method of construction of buildings and shelters to resist the effect of the explosion.

In the six appendices some interesting and useful information is given on the methods and procedures of determining by computation and measurements the effects of the blasts and the products of the explosion under the different conditions previously discussed in the preceding chapters.

The book is a useful source of information for technologists interested on the scientific and practical aspects of atomic energy associated with atomic explosion.—R. H. A.

[New names and new combinations are printed in *italics*]

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